Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

:rve
43
53

FOREIGN AGRICULTURE REPORT

OFFICE OF
FOREIGN AGRICULTURAL RELATIONS
U.S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D.C.

THE MARKET OUTLOOK AND PROSPECTIVE COMPETITION FOR UNITED STATES RICE IN ASIA, THE NEAR EAST, AND EUROPE

A REPORT OF A SURVEY OF THE RICE SITUATION IN ASIA, THE NEAR EAST, AND EUROPE IN 1948

JUL 19 1949
U.S. DEPARTMENT OF AGRICULTURE

By

J. NORMAN EFFERSON
AGRICULTURAL ECONOMIST

FOREIGN AGRICULTURE REPORT No. 35 JUNE 1949

ACKNOWLEDGMENT

The author wishes to acknowledge the assistance rendered by Thelma Willahan, Russel Kifer, Wolf Ladejinsky, and Monroe McCown of the Office of Foreign Agricultural Relations in the preparation of the statistical data used and in the checking and editing of the manuscript. He also wishes to express his appreciation to the foreign service officers in the different countries surveyed who cooperated by making arrangements, supplying data, and otherwise facilitating the completion of this study. Special assistance was given by Douglas Crawford, Agricultural Attaché, Manila; Owen Dawson, Agricultural Attache, Shanghai; Henry W. Spielman, Consul, Bombay; Edwin R. Raymond, Agricultural Attaché, Cairo; Jerome T. Gaspard, Agricultural Attaché, Brussels; and Mark Williamson and Bruce Johnston of SCAP, Tokyo.

FOREWORD

The United States rice industry depends upon export outlets for about 40 percent of the domestic production of its grain. Because of the need for the appraisal of the factors that will contribute to the determination of levels of production and consumption of, and international trade in, rice in major exporting and importing areas of the world, thus affecting the export market for rice produced in the United States, a study of the situation was made in producing countries of the Far East, the Near East, and southern Europe and in importing countries of western Europe during the period, March-August 1948.

Dr. J. Norman Efferson, while on leave from his duties as Agricultural Economist at the Louisiana State University and Agricultural and Mechanical College, conducted the first-hand study for this Office; and this report summarizes his observations of the situation in the 19 countries he surveyed.

This study was conducted under the provisions of the Research and Marketing Act of 1946. The possibilities of broadening the foreign market for other agricultural commodities also are being studied by this office, and the findings are presented in other circulars and reports that may be obtained, free, from the Office of Foreign Agricultural Relations, United States Department of Agriculture, Washington 25, D. C.

Joseph A. Becker

Joseph A. Becker, Chief
International Commodities Branch

C O N T E N T S

	Page
SUMMARY AND CONCLUSIONS	1
THE RICE REGIONS OF THE WORLD	3
THE SURPLUS-RICE REGIONS OF ASIA	4
Burma	9
Siam	14
French Indochina	17
Korea	20
THE DEFICIT-RICE REGIONS OF ASIA	24
China	29
Japan	34
India and Pakistan	39
Republic of the Philippines	45
Malayan Union	48
The Netherlands Indies	52
Hong Kong	55
THE SURPLUS-RICE REGIONS OF THE NEAR EAST AND EUROPE	58
Egypt	60
Italy	65
THE DEFICIT-RICE COUNTRIES OF EUROPE	69
Switzerland	71
Belgium	73
France	74
The Netherlands	75
Denmark	76
Sweden	78

THE MARKET OUTLOOK AND PROSPECTIVE COMPETITION FOR UNITED STATES RICE IN ASIA, THE NEAR EAST, AND EUROPE

by

J. Norman Efferson, Agricultural Economist

SUMMARY AND CONCLUSIONS

This report presents the results of a 1948 survey of the major rice-producing and -consuming countries of Asia, the Near East, and Europe. The study had two major objectives: (1) To appraise the probable competition to be expected from the surplus-rice areas of Asia, the Near East, and Europe and (2) to evaluate the possibilities of marketing United States rice in the deficit-rice areas of Asia and Europe. Since world rice production is increasing while United States and Latin American production and export supplies remain at the relatively high wartime levels, the most serious marketing problem of the United States rice industry is maintaining and expanding foreign market outlets for the 40 percent of the crop that must be exported.

Although the world production of rice in the crop year 1948-49 is forecast at about the prewar level, export supplies are estimated at about half that of prewar years. Rice production in North America, South America, and Africa is expected to be more than 50 percent greater in 1948-49 than the average of the 5-year period preceding the war. In the surplus-producing regions of Asia, however, where more than three-fourths of the normal export supplies of the world are produced, the 1948-49 acreage and production is expected to be only about 80 percent of the prewar level. In the deficit-producing countries of Asia, and in Europe, rice production in 1948-49 is indicated to be about the same as the prewar level.

The long-time world rice picture indicates that the United States rice industry is likely to face a series of important adjustments in the next few years. Although production in the surplus Asiatic areas will be less than prewar, imports by the deficit areas of Asia are likely to be less; and the decreased production will thus be largely offset by the decreased effective demand for available export supplies. In addition, expanded production in the Near East and Europe may make it more difficult to maintain some of our normal prewar export markets. Increased availabilities as compared with the low of 1945 and 1946 have already caused a weakening of world rice prices, and, although no drastic decline is expected immediately, prices cannot be expected to remain at wartime levels. Inasmuch as the world supply situation is likely to improve gradually, the United States rice industry must prepare for competition that may be as intense as that experienced in world markets in the 10 years before the war.

The problem of disposing of a rice output equal to our recent wartime level of supplies is not hopeless. It can be done if we meet worldwide competition and if we market abroad the types and qualities desired. In the past, rice has been a relatively cheap world commodity because of the low costs of labor and the low standard of living in Asia. The recent trends in the Asiatic rice world, however, indicate that exports of rice are not likely to regain prewar levels in the near future, and the price of Asiatic rice will not be as low in the prewar period. Also, Asiatic producers will not be able to reduce costs significantly by mechanization. On the other hand, the United States rice industry is now solving its high labor-cost problem by mechanization and improved production practices. If the United States rice industry is maintained on a competitive cost-reduction basis and the industry continues its efforts towards maintaining and expanding export markets, there is some reason to believe that within a few years the industry could market some of its export supplies of rice in Asia, at a profit and without subsidization, in direct competition with the nearby surplus areas of Asia.

In the areas studied, the countries in which the best possibilities for developing markets for United States rice were offered were the Philippine Islands and Japan, and Switzerland, Belgium, Greece, and Allied Germany. Whether these possibilities become realities, however, will depend upon the ability of the United States rice industry to adjust itself to the specific requirements of these countries. If United States rice prices are in line with those of competing areas, quality and transportation differentials considered, and if the United States industry supplies each country with the type of rice preferred by the consumers, long-time rice markets can be built up in some of these countries. However, if the industry uses these regions as a temporary dumping ground for low-quality rice, competing areas will soon take away all remaining rice markets outside of the Western Hemisphere.

The Philippine Islands require a highly milled, long-grain, hard-type rice. The consumers of the Republic of the Philippines do not object to a large percentage of broken grains, but undermilled rice or rice that contains a large percentage of red rice or other impurities is unpopular. Japan wants short-grain rice, and, because of consumer preference for freshly milled rice, most of their imports are likely to be in the form of brown or hulled short-grain rice, which can be milled in Japan prior to consumption. The European countries desire small quantities of long-grain, highly milled rice for the high-income consumer; but the major part of the demand is for short and medium grain rice. Europe, also, is likely to import mostly brown or hulled rice because of the existing rice-polishing mills in the area and the demand for the byproduct of the milling operation for use as feed.

The surplus-producing countries of Asia, which provided the most serious competition to United States rice in foreign markets in the years before the war, will find it difficult to regain prewar production levels in less than 3 to 5 years; and prewar export levels from this region may not be reached in less than 5 to 8 years. Based on observations of this region in 1948, it seems likely that rice production will become rela-

tively stable at about the prewar level in 1952 to 1955, and export supplies for the 1955-60 period will approximate 5 million short tons annually in place of the prewar average of 6.5 million short tons.

Because of the slowness of the Asiatic surplus areas in regaining prewar levels, there appears to be little possibility that world rice supplies will suddenly become greater than the effective demand, thereby causing a rapid decline in world rice prices such as occurred after World War I. In terms of prewar consumption rates, the world is still short of rice, and the commodity is likely to remain relatively scarce for several years to come. In comparison with the 1945-47 period, however, the rice-supply situation has improved, and the so-called starvation period in the rice-consuming countries of Asia has ended.

In spite of an increasing population, the deficit rice-consuming countries of Asia are not likely to require total imports as great as the prewar level. Because of the expanded domestic production of rice, the increased use of substitute foods including internal production and imports, and the lack of purchasing power, the deficit-rice areas of Asia are not likely to take as much rice in the immediate future as the 6 million short tons of annual imports in the 1936-40 period.

The surplus-rice-producing countries of the Near East and Europe, Egypt, and Italy have expanded rice production more than 20 percent above prewar levels and are likely to maintain this postwar peak in rice production during the next 5 to 10 years. All of the rice produced in this region for export is of the short-grain, semiglutinous type; but it compares favorably with short-grain rice produced and milled in the United States. Therefore, since this region is located near the deficit-consuming countries of Europe, it is likely to compete more actively with United States short-grain rice in these markets than before the war.

Although Europe imported about 1.5 million short tons of rice annually in the prewar period, about half of this amount was low-quality, broken rice used for livestock feed. The movement of rice into Europe for feed will be resumed only when rice supplies are such that world prices are low as compared with other grains. This situation, however, is not expected to exist in the next 5 years.

Most of the remainder of the rice imported into Europe, prewar, was short- and medium-grain rice. Europe's prewar imports came from Italy, Egypt, and Asia, with only small amounts from the United States. The outlook for marketing large quantities of United States rice in Europe is not bright.

THE RICE REGIONS OF THE WORLD

Rice is the most important food for about half of the world's population. In the immediate postwar period, rice became one of the most important food commodities in short supply throughout most of the world. World rice production declined more than 13 percent from the 5-year, 1935-36 to 1939-40, prewar level to that of the 1945-46 crop year. World export supplies declined from an average of about 9 million short tons of milled rice in the prewar period to 2 million tons in 1946.

Contrary to trends in Asia and Europe, the United States rice area increased from about 1.0 million acres in the prewar period to 1.5 million acres in 1945 and to an all-time peak of about 1.7 million acres in 1947 and 1948. With fairly constant yields, United States rice production increased from 50 million bushels of rough rice in the prewar period to more than 80 million bushels in 1948, an increase of 60 percent. Rice production in Latin America followed the same pattern, with an increase of about 100 percent in 1945-46 over the prewar period. Rice production in the Americas expanded during the war years because of the reduction of available supplies from Asia and corresponding increases in prices.

United States exports of rice increased from an annual average of 107,000 short tons for the 1936-40 period to 490,000 tons in 1947. This resulted in a postwar export volume almost five times as great as that of prewar years. Rice consumption within the United States remained relatively constant throughout the war years, and most of the increased production went into export channels. Less than 15 percent of the total rice production of the United States was exported in the prewar period, as compared with 40 percent in 1947.

About 95 percent of world rice supplies are produced in Asia, and most of the decline in world production during the war years was due to decreases in acreage and yield per acre in the major rice regions of Asia. Since the low point in production was reached in 1945, Asiatic production of rice has increased. The world rice harvest of 1947-48 was 2 percent larger than that of the preceding year, 9 percent larger than the low point of 1945-46, and was 95 percent of the prewar average. World rice production in 1948-49 is forecast to be about equal to the prewar average. Recent trends in the acreage, production, and export trade of rice in different world regions are shown in tables 1 and 2.

The question of maintaining foreign outlets for United States rice is a serious one. World rice production is increasing and the production and export supplies of the United States and Latin America remain at the relatively high wartime levels. The object of this report is to present the results of a recent survey of certain major rice-producing and -consuming countries in an attempt to appraise the probable competition to be expected from the surplus-producing countries of Asia and the Near East, and Europe, and to evaluate the possibilities of marketing United States rice in the deficit-consuming countries of Asia and Europe.

THE SURPLUS RICE REGIONS OF ASIA

The major areas in Asia that produced sufficient rice to supply domestic needs as well as additional quantities for export were in Burma, Siam, French Indochina, Korea, and Taiwan (Formosa). The three "rice-bowl" countries of southeast Asia - Burma, Siam, and French Indochina - had combined exports of about 6.5 million short tons, annually, of milled rice and rice products in the 1936-40 prewar period. Most of the remainder of the exportable surplus of rice in Asia came from Korea and Taiwan (prewar Japanese colonies), and this surplus was shipped to Japan.

During the war years, production in the surplus-rice areas of Asia declined to a greater extent than in any of the other major rice areas

of the world. Rice acreages in the Asiatic surplus areas decreased from about 40 million acres in the 1935-36 to 1939-40 prewar period to about 28 million acres in 1946-47. Since this low point, acreages for this region as a whole have increased to 31.5 million acres in 1947-48 and to

TABLE 1.- *Rice acreage and production in major world regions, averages 1935-36 to 1939-40, annual 1946-47 to 1948-49*[1]

REGION	1935-36 to 1939-40	1946-47	1947-48	1948-49[2]
ACREAGE:	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*
Asia	196,900	191,360	195,280	199,190
South America	2,960	5,370	4,970	5,240
North America	1,430	2,320	2,460	2,580
Africa	4,210	6,930	7,020	7,110
Europe	560	560	600	660
Oceania	40	90	80	90
World total[3]	206,500	207,000	210,800	215,300
PRODUCTION:	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*
Asia	7,123,050	6,455,670	6,581,000	6,965,000
South America	89,440	175,340	144,740	155,000
North America	63,180	94,630	101,390	107,330
Africa	107,850	146,800	163,080	168,290
Europe	53,150	40,720	54,540	54,140
Oceania	2,700	4,800	4,660	5,160
World total[3]	7,455,000	6,929,000	7,064,000	7,473,000

[1] Crop year beginning August 1.
[2] Preliminary.
[3] Includes USSR in Europe and Asia.

Office of Foreign Agricultural Relations. Compiled from official and other sources.

TABLE 2.- *Rice exports from major world regions, calendar years, average 1936-40, annual 1946-48*

REGION	AVERAGE 1936-40	1946	1947	1948[1]
	1,000 short tons	*1,000 short tons*	*1,000 short tons*	*1,000 short tons*
Asia	8,114	1,149	1,865	2,840
South America	80	345	376	315
North America	116	391	505	430
Africa	156	185	190	40
Europe	170	7	5	55
Oceania	13	28	19	30
World total[2]	8,679	2,105	2,960	4,010

[1] Preliminary.

[2] Includes USSR in Europe and Asia.

Office of Foreign Agricultural Relations. Compiled from official and other sources.

33.0 million acres in 1948-49. Even with these increases, the acreage is still 20 percent below prewar levels. Rice production in the area has followed the acreage trends, decreasing from 1.2 billion bushels annually in the prewar period to only 769 million bushels in 1946-47 and increasing to about 1 billion bushels in 1948-49.

Total rice exports from the more important surplus areas of Asia averaged 7.1 million short tons of milled rice and rice products in the 1936-40 prewar period. Total exports from this region amounted to only 1.1 million tons in 1946 but increased to 1.9 million tons in 1947 and to more than 2.8 million tons in 1948. Exports from the area in 1948, however, were only 40 percent of those of the prewar period. Trends in the acreage, production, and net exports of rice from the more important surplus areas of Asia are presented in tables 3 and 4.

In the surplus region of southeast Asia - Burma, Siam, and French Indochina - the indications are that it will be from 3 to 5 years before the area as a whole regains prewar levels of rice production and possibly even longer before prewar levels of export supplies are reestablished. Rice production in the southeast Asia area has decreased because of a combination of factors including: (1) Limited markets for the product during the war years resulting from disrupted transportation facilities and trade channels; (2) the destruction of rice mills, warehouses, and transportation facilities; (3) the loss of work animals on farms and the destruction of irrigation facilities in the producing regions; (4) the movement of the farm population to cities and to other regions; and (5) internal political and military developments within some of the countries since the end of the war that have developed into full-scale revolutions in some cases. Much of the loss in buildings and equipment has been restored, and workstock numbers are increasing. The internal disorder within some of the countries, especially French Indochina and Burma, is now the major factor retarding the expansion of rice production. When stability is established and maintained, it will still be 2 to 3 years before the available production, transportation, and milling facilities for rice can be utilized to the fullest extent. Because of the farmers' lack of confidence in the relatively unstable governments and the shortage of consumer goods in rural areas, any large, immediate expansion of production is improbable. Farmers confidence in the currency must be established, and consumer goods must be available to purchase with the currency received in exchange for their surplus rice before this region will regain its prewar levels in rice production.

An additional factor will be important in determining the long-time, postwar rice-production pattern of this region in southeast Asia. Since the end of the war, the tendency in each of the countries of this area has been more and more toward centralized governmental control and less and less toward the prewar pattern of relatively free trade and freedom of enterprise. Thus, in 1948, rice exports from Burma, Siam, and French Indochina were rigidly controlled by the respective governments. Although the detailed methods of accomplishing the objective varied, in each country the government received between 30 and 40 percent of the export price of all rice officially exported. With an export

TABLE 3.- *Rice acreage and production in the major surplus-rice countries of Asia, averages 1935-36 to 1939-40, annual, 1946-47 to 1948-49*[1]

COUNTRY	1935-36 to 1939-40	1946-47	1947-48	1948-49[2]
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*
ACREAGE:				
French Indochina	14,306	9,750	10,650	11,000
Burma	12,671	7,788	9,154	9,854
Siam	7,088	[3] 5,500	[3] 6,700	[3] 7,100
Korea	3,838	2,712	2,753	2,782
Taiwan(Formosa)	1,616	1,435	1,631	1,700
Iran	534	544	545	545
Total	40,053	27,729	31,433	32,981
	1,000 bushels	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*
PRODUCTION:				
French Indochina	319,910	210,000	235,000	250,000
Burma	348,534	194,942	270,547	264,500
Siam	213,079	[3] 170,000	[3] 230,000	[3] 250,000
Korea	195,763	114,792	131,983	153,722
Taiwan (Formosa)	85,704	59,015	71,727	74,200
Iran	18,577	20,576	15,606	21,560
Total	1,181,567	769,315	954,863	1,013,982

[1] Crop year beginning August 1.
[2] Preliminary.
[3] South Korea only.

Office of Foreign Agricultural Relations. Compiled from official and other sources.

TABLE 4.- *Net exports of rice from the major surplus-rice countries of Asia, calendar years, average 1936-40, annual, 1946-48*

COUNTRY	AVERAGE 1936-40	1946	1947	1948[1]
	1,000 short tons	*1,000 short tons*	*1,000 short tons*	*1,000 short tons*
Burma	3,268	480	887	1,360
French Indochina	1,610	109	74	200
Siam	1,460	492	423	870
Korea	1,061	-	-	-
Taiwan(Formosa)	709	-	440	400
Iran	29	66	63	20
Total	7,137	1,147	1,887	2,850

[1] Preliminary.

Office of Foreign Agricultural Relations.
Compiled from official and other sources.

price of between 7 and 8 cents per pound for milled rice, f.o.b. the surplus port, the different governments received an average of 3 cents per pound, the transportation and milling agencies received about 1½ cents per pound, and the producer received only 3 cents per pound. In most cases, these governments made a net profit on all export rice equal to, or greater than, the total amount paid the farmer for producing the rice.

This tendency in the southeast surplus region toward government control of rice exports and low returns to producers has greatly slowed down rice expansion in the region. The frequently stated opinion in Asia that "Asiatic farmers do not expand production according to relative prices" is given by many in these countries as the justification of a policy that requires the farmer to pay most of the costs of government and for which he receives little or nothing in return. In some of the deficit-rice countries of Asia, however, where the producer has been paid higher prices with the increased demand for rice, the indications are that the Asiatic farmer is just like the farmer in any other part of the world; when prices go up, he expands production; when prices go down, he cuts it. As long as the present policy of indirect taxation of the rice farmer in southeast Asia is maintained, expansion of rice production will be retarded.

The export profits made by these governments have brought about another problem in regard to international trade in rice. Because the government profit is so large, the smuggling of rice out of the country has been greatly stimulated. The rice miller who can dodge the tax just makes a profit four times as great as he earns if he sells the rice through official channels. As a result, the official export figures from these various countries definitely understate their total export trade in rice. Based on observations in each of the countries involved, 500,000 short tons of rice, in addition to the amounts given in official figures heretofore, were probably exported from this region in 1948. Thus, international rice trade from this area is closer to prewar levels than the official data would indicate.

Inasmuch as the population of the surplus-rice areas of southeast Asia has been increasing at the rate of about 2 percent a year, larger rice supplies will be needed for domestic consumption than were consumed before the war. This means that, even with a volume of production equal to that of prewar, export supplies cannot be as great as in the earlier period. However, there are additional areas of land that could be developed for rice, especially in Burma and French Indochina, and production in the region as a whole could possibly be established at higher levels than prewar, assuming that proper incentives were paid for this expansion program.

Considering the increase in population, and the internal disorders in some of the countries, it is unlikely that prewar production levels will be reached in less than 3 to 5 years, or prewar export levels in less than 5 to 8 years. The indications are that production will become relatively stable at about the prewar level in 1953 to 1955 and that the exports from this area for the 1955-60 period will be less than the 6.5 million short-ton prewar average.

In the other prewar surplus-rice areas of Asia, Korea, and Taiwan, the outlook for export supplies is not so bright. Because of a greatly increased population in Korea, a shift in normal food exports and imports due to its removal from the Japanese sphere of influence, and the elimination of imports of soybeans and coarse grains from Manchuria, Korea is not likely to produce any more rice than is needed for domestic consumption. Taiwan, now under Chinese control, has a potential surplus of from 300,000 to 500,000 short tons of milled rice annually, but this rice is not likely to move to the prewar market in Japan. For this reason, Japan must look elsewhere for rice supplies.

A more detailed summary of the facts obtained from the survey of Burma, Siam, French Indochina, and Korea is presented as follows:

Burma

Rice production in Burma for the 1947-48 marketing season amounted to about 271 million bushels, on a rough-rice basis, and was produced on an area of 9.15 million acres. Production for the 1948-49 season is now estimated at only 265 million bushels on 9.85 million acres, as compared with the prewar average (1935-36 to 1939-40) of 12.7 million acres and 349 million bushels annually. Total rice production in Burma was more than 20 percent less than the prewar annual average in 1948 and cannot be expected to reach prewar levels before 1950.

Of the 1947-48 production, about 1.4 million short tons of cleaned or milled rice was exported, and the 1948-49 export supplies cannot be expected to be materially above this level. Annual exports of cleaned rice and rice products from Burma in the 1936-40 period averaged about 3.3 million short tons. Total exports of rice from Burma were less than one-half of the prewar level and are not expected to reach prewar levels within the next 3 years. Exports have declined more than total production because of two factors: (1) An increase in population within the country, causing larger domestic consumption, and (2) internal disturbances, which have prevented some of the rice from moving from the producers to the export millers. In addition, the official export figures appear to be somewhat understated, due to the fact that some rice is being smuggled out of Burma in order to dodge the usual government profit that is made on official export sales.

The Burman Government in the first part of 1948 established acreage and exportable surplus targets for the next 4 seasons as follows:

	Acreage	Exportable surplus
	Million acres	*Million short tons*
1948-49	10.0	2.4
1949-50	10.7	2.7
1950-51	11.5	3.3
1951-52	12.0	3.6

Based on purely economic considerations at that time, an exportable surplus of 2 million short tons or more was estimated to be possible from

the 1948-49 crop with an annual average of more than 3 million short tons after 1950. However, most of the people interviewed in June 1948 expressed the opinion that, due to the political unrest and frequent military disturbances in Burma, the export surplus from the 1948-49 crop would not exceed exports for the preceding year and could be less. If the Government is stabilized, peaceful conditions established and maintained in the production areas, and the producers given a reasonable share of the gross returns, the export surplus is likely to reach prewar volume within 2 to 3 years.

The State Agricultural Marketing Board was the only official exporter of rice in Burma in 1948. Private firms that purchased rough or milled rice for export had to sell their supplies to the Agricultural Marketing Board at fixed prices. Certain private firms were employed by the Agricultural Marketing Board to act as its agents in obtaining rice supplies for export. These firms received the equivalent of about $1.10 per short ton of milled rice for their services. All rice purchased by the Board for export was bought "ex-hopper" at the mill, with the Board paying the costs of sacks, loading, sewing, handling charges, storage, testing, weighing, loading into lighters, and towing out to the ships. Of the total exports in 1948, it is estimated that 25 percent were purchased directly by the Board and 75 percent through certain designated rice-handling agencies on the contract basis as indicated above.

At the official exchange rate, the price paid to farmers for rough rice in Burma in 1948 averaged about .80 cents per bushel, or $2.90 per barrel. The Marketing Board paid the equivalent of about 90 cents per bushel at the port of Rangoon. Although there were no official grades established for rough rice, the millers reported that they paid slight discounts or premiums for low- or high-quality rough rice. They stated, however, that most of the rice moving into commercial channels was of a standard quality.

There were only three different grades of milled rice available for purchase in Burma in 1948. The first was "Sughandi," which was long-grain, translucent rice milled to 38 to 42 percent brokens. This was the most popular type for consumption in Burma. The second was "small mills specials," which was short- to medium-grain rice, somewhat undermilled, with 38 to 42 percent brokens. This grade was the major type moving into export channels. The third classification was broken rice. Prior to the war, there were numerous other grades, but, with the current postwar shortage of rice, the Agricultural Marketing Board felt that one major grade of medium-quality rice to provide uniformity in all shipments would be preferable to many different grades with variations in quality from shipment to shipment. About 80 percent of the exports of rice from Burma in 1947 and 1948 were of the "small mills specials" classification. For this quality, the Board paid millers the equivalent of about $3.25 per hundred pounds and, for broken rice, $1.45 per hundred pounds.

Upon receipt of the milled rice or rice products, the Agricultural Marketing Board sold it to exporters in accordance with allocations of the

International Emergency Food Council. All export prices were on an f.a.s. basis, with the Board paying all costs up to the ship and the purchaser accepting delivery on the ship and paying the costs of storing on the ship. The prices charged by the Board to the exporter for rice loaded in the harbor of Rangoon in 1948 were about $7.20 per hundred pounds for "Sughandi," $6.84 per hundred for "small mills specials," and $4.32 per hundred pounds for broken rice. The price of rough rice for export in 1948 was set at $4.32 per hundred pounds; for white rice bran, $1.98; and for bran produced from parboiled rice, $1.61 per hundred pounds.

The most interesting phase of this whole transaction is that while the miller was paid $3.25 per hundred pounds for "small mills specials," the Board received $6.84 per hundred for the product after sacking and hauling it out to the ship. This pattern is the same as was observed in the two other important rice-exporting countries of Asia, Siam, and French Indochina. In Burma as well as in the other two countries, the government profit from handling the rice was greater than the amount paid the producer for growing, harvesting, and marketing the product.

Although the 1948 export price for Burma's rice appears to be lower than that of Siam for the same year, when grade and quality are considered the prices are about the same. The apparent price differential results from the different methods of marketing and from variations in grading practices. Burmese export prices are based on the sales of only three different grades and, in most cases, delivery of only one grade is made. The Siamese price list for 1948 included six different grades of white whole rice; five grades of glutinous whole rice; seven grades of white broken rice; and four grades of glutinous broken rice. The importing countries obtaining rice from Siam were required to take their proportionate share of all of these different types.

The rices from the two countries are not the same and would not be directly comparable, even if they were graded in exactly the same manner. Siamese rice is mostly of the hard, long-grain, translucent type, while Burmese rice is mostly short- or medium-grain of the semiglutinous type. Burma "small mills specials" is slightly higher milled than the medium-grade Siam No. 2 and has a somewhat better appearance when freshly milled; but, according to reports from importing countries, this type does not hold up as well under shipment and storage. Markets in India, Japan, and Korea reflect the preference in these countries for Burmese rice. In other markets, such as China, Malaya, and Hong Kong, the greater demand is for the hard, long-grain rice (excepting brokens) of Siam.

Burma, in 1948, sold only one major grade (the 38 to 42 percent brokens "small mills specials") to most exporters. The problem of selling low grades and broken rice was solved by offering one uniform grade of fairly low quality. In areas where supplies were short and rice was rationed, this distribution of one uniform grade, which was the same from shipment to shipment, caused fewer complaints from consumers than was the case with the many different grades of Siamese rice. In 1948, higher quality rice could be obtained in Siam, but this country also required all exporters to take their proportionate share of the low grades, the

glutinous rice, and the broken rice. As a result, some difficulties were encountered in distributing these many different grades under rationing programs. Although the Siamese policy of maintaining wide grade differentials in the shortage period caused more complaint than the uniform Burmese, one-grade system, the Siamese industry may benefit by securing preferential markets for high-quality rice in the future when supplies become more plentiful.

The present Burmese policy is unlikely to result in the offering of high-quality rice to compete with United States rice in European and Latin American markets. Even with more intense grading, Burmese rice would compete only with United States short-grain types, since most of the rice produced in Burma is of that type. The better grades of Siam's rice, however, are as good as much of the long-grain rice produced in the United States.

About 98 percent of the rice acreage in Burma is irrigated rice, and the remainder is upland, dryland rice. Since most of the rice region of Burma has an annual rainfall of from 100 to 250 inches annually, all of which falls during the 5-month growing season, little formal irrigation is practiced. The crop is transplanted at the beginning of the rainy season and harvested when the rains stop and the fields begin to dry. The land is plowed in May or early in June, the nurseries are planted in June, and transplanting is done in July and August. No fertilizer is applied, but yields are maintained by the annual deposits of silt from the summer flood waters. Harvesting begins in November, reaches its peak in December and January, and continues through February. The crop is cut by hand, dried in the field, and threshed on hard, compact, outdoor threshing floors made of a mixture of cow manure and mud. The cut grain is piled on the floor, and cattle are driven over and over the stalks until the grain is stomped free of the straw. After winnowing, it is piled up to await sale or stored in bamboo boxes in the farmhouse for home use. The average area of rice per farm varies from 10 to 15 acres.

The surplus grain is ordinarily purchased by traveling dealers who move from village to village, usually by boat, collecting supplies and transporting them to the mills in the exporting centers (figure 1). Rough rice in Burma is purchased by volume, with the usual measure being a basket of 9 gallons, which holds 46 pounds of rough rice of average quality. Although the volume of the basket is standardized by common agreement, all baskets are home-made, and most buyers use baskets as large as they feel they can safely get by with. Some agricultural workers in Burma report that the average rice buyer expects to obtain a 10-percent overrun by means of using variable-sized baskets.

There are about 700 rice mills in Burma, most of which are located near ports, principally Rangoon. About 20 percent of the milling capacity of Burma was destroyed during the war, but most of the mills have been restored. They are of the large centralized type, are operated by steam power, and use rice hulls for fuel. About 8 percent of the total production of rice in Burma is hand-pounded on the farms for local use, but supplies for the cities and for export are milled in the population

FIGURE 1.- Transporting rough rice and other farm products from the rural areas to market in Siam. Most of the rice exported from Siam is brough in from the rural areas by this method. This itinerant buyer operates within a 50-mile radius of Bangkok.

FIGURE 2.- Flooding and plowing rice fields in China. In preparing the rice fields in Asia, the usual procedure is to flood the land, then turn the soil with a "one cow" plow or by hand (see figure 3). Note typical irrigation equipment at the left.

FIGURE 3.- Hand "plowing" a rice paddy in Japan. The rice-straw aprons provide some protection against the water and mud.

FIGURE 4.- "Puddling" a rice paddy in Japan. After the land is plowed, the clods are broken down by intensive working to produce a smooth mass of mud in preparation for planting.

centers. Most consumers in Burma prefer the hard, long-grain type of rice; and the short-grain rice produced for export is not used by the local population. However, the area planted to short-grain rice is relatively large because of the higher yields per acre obtained and the higher milling yields.

Prior to the war, about 40 percent of all rice exports from Burma were of parboiled rice. Millers produced this type because of the higher yields of head rice obtained by the boiling process. It was marketed primarily in certain sections of India where fuel shortages prevented daily cooking. Consumers preferred this type because it would keep for several days after cooking. Average yields of head rice from standard paddy in Burma after parboiling are 71.6 percent with only 0.5 percent brokens and 2.45 percent bran. Average yields of raw rice of the medium quality "small mills specials" raw or unparboiled rice from standard paddy are 62.6 percent head rice, 5.3 percent brokens, and 5.6 percent bran. Yields for Burma's standard quality exported to Europe in prewar days, "Europe No. 1" were 42.0 percent head rice, 21.7 percent brokens, and 10.5 percent bran. This rice is similar to the standard type milled in the United States.

Since the end of the war, parboiling has declined and in 1948 parboiled rice made up only about 25 percent of the total exports of rice from Burma. The millers in Burma reported that this practice is changing because of cost factors. Prior to the war, with relatively cheap labor and reasonable costs for machinery, the extra yield of head rice obtained by the parboiling process more than offset the added costs. In recent years, however, high labor costs, together with the high costs of machinery and replacements, have made the production of raw-milled rice more profitable than the parboiled product. Since the export price of parboiled rice is the same as that for raw milled rice, the millers stated that the shift away from parboiled rice in Burma would continue until some price differential was established that paid for the added costs of the process. Consumers within Burma will not eat parboiled rice, but a major market for the product continues to exist in India.

Two types of commercial parboiling are practiced in the mills: (1) Steam-dried parboiling and (2) sun-dried parboiling. In the steam process, the rice is first soaked for 2 to 3 days in warm water, then subjected to steam pressure of 5 to 10 pounds for 10 to 30 minutes, and finally dried indoors. The indoor drying floors are of concrete with inlaid steam pipes to speed up the drying process. After this boiled, rough rice is dried, it is milled in the usual manner. It is cheaper to produce parboiled rice by this method than by the sun-dried method, but it is inferior in quality and has a deep yellow color. In the sun-dried process, the soaking and steam treatment is the same as that for steam-dried parboiling, but the rough rice is spread out on wide, outdoor, concrete floors and slowly dried in the sun for several days. This is a slow, more expensive process, requiring more labor, but it produces a better product, which is almost white in color.

Prior to the war, Burma was the world's largest exporter of rice, shipping about 3.5 million short tons of rice and rice products annually,

which accounted for from 35 to 40 percent of all rice entering world trade. In 1948, Burma was still the largest exporter but was shipping out less than one-half the prewar volume. At the earliest, the prewar volume of exports cannot be expected to be reached in less than 2 to 4 years; and it may take 10 years if internal political disturbances continue. In the meantime, the population of Burma - about 17.5 million in 1948 - has been increasing at the rate of almost 2 percent a year. This increase in population will necessitate more rice for consumption within the country. In addition, the attitude of the new Government of Burma has been to discourage immigration; and, since itinerant laborers from India harvested much of the prewar production, there is some doubt that Burma can soon regain prewar levels without importing extra labor during the harvest season. All of these facts lead to the conclusion that rice supplies from Burma will continue to be relatively small for several years to come.

Since Burma produces mostly short-grain rice for export and has traditionally marketed most of their surplus production in India and other nearby, low-income regions, this continued shortage of rice from Burma is not likely to seriously affect United States rice markets. If the importing countries of Asia continue to require rice supplies as large as those before the war, however, this relatively low supply in prospect from Burma is likely to prevent any sudden or heavy pressure of Asiatic rice supplies on our Latin American and European markets.

Siam

Total rice production in Siam for the 1947-48 marketing season amounted to about 230 million bushels, produced from 6.7 million acres. Production in 1948-49 is expected to be around 250 million bushels from an acreage of slightly more than 7 million. Prewar production (1935-36 to 1939-40) averaged 215 million bushels, annually, from 7.1 million acres.

Siam is regaining its prewar status in total rice area and production and shows promise of expanding production beyond long-time, prewar levels. In regard to total export supplies, however, the picture is not so bright. In the 1936-40 prewar period, annual rice exports from Siam averaged almost 1.5 million short tons. Exports for the 1947-48 marketing season amounted to only 870,000 short tons, less than 60 percent of the prewar average. Assuming that there are normal yields with no unusual disturbances in the country, exports in 1948-49, even with an acreage above prewar, cannot be expected to be more than 1.2 million tons. Since the beginning of the war, the population of Siam has been increasing rapidly, and a larger part of the rice produced is being consumed within the country, resulting in smaller export supplies.

Siamese Government officials forecast that prewar export levels in rice would be reached within 2 to 3 years. Most other observers, however, did not hold this view but felt that, except for an occasional year or two when weather conditions are unusually good, the country would not regain its prewar position as an exporter of rice. This reasoning

was based on the fact that the population of Siam had increased from about 10 million, as of 25 years ago, to almost 18 million in 1948, while total rice production had remained relatively constant. With a fairly constant, per-capita consumption of 250 pounds of milled rice annually, the people in the country will continue to take a larger part of the total supply. A long-time export figure of from 1.2 to 1.4 million short tons annually, appears probable for the next 10 years.

Rice marketing practices in the country are as follows: Any surplus production on the farms is usually sold to traveling buyers who paddle down the canals and streams in sampans, which stop at each farm (figure 1). In 1948, buyers were paying farmers the equivalent of between 70 and 85 cents per bushel for rough rice. The buyers then transported the rice to the Bangkok area where they sold it to the millers according to grades and prices, which were set by the Government. The grades of rough rice are based on the percentage of broken grains in a test sample and include six different classes varying from "heavy paddy, first grade" with 5 percent or less of broken grains to "light paddy, second grade" with more than 35 percent broken grains. There is no variation in grade or price for different varieties or types of rice. Most of the rice in the markets appeared to be similar to the United States medium- to long-grain types.

The dealers are paid a fixed price for this rough rice by the millers in accordance with a schedule set by the Government. The prices range from 75 to 90 cents per bushel, depending upon the grade. The millers, in turn, are required to sell all of their output to the Rice Office of the Ministry of Commerce at prices ranging from the equivalent of $3.10 per hundred pounds for the top grade of whole rice down to about $2.70 per hundred for the lowest grade of whole rice. The Rice Office then adds a flat margin in lieu of an export tax amounting to about $36.00 per short ton and sells to the export buyer. For domestic sales, this fee does not apply. Actually, the Rice Office does not handle the rice. The buyers contact the mills, examine the rice, make arrangements with the Rice Office to buy it, then load and ship it directly from the mills. The buyer then pays the Rice Office, and the Rice Office pays the miller.

At the official rate of exchange, exporters in Siam bought rice in 1948 at prices ranging from $8.00 per hundred pounds for the top-quality, highly-milled, whole-grain rice to $6.00 per hundred for the lowest grade of whole rice. In terms of quality and grain type, the higher grades compare favorably with United States long-grain rice. Most of the rice exported from Siam in 1948, however, was of the lower grades with 25 to 42 percent broken grains.

The official Siamese rice grades include six different grades of white whole rice; five of glutinous rice; seven of white broken rice; and four grades of broken glutinous rice. The grades of white milled rice are based primarily on the percentage of broken grains, with the degree of milling a secondary consideration. The top grade has a broken grain tolerance of 5 percent or less, while the sixth and lowest grade contains 35 to 42 percent broken grains. The grades of broken rice are based on the size of the grain, the percentage of foreign matter, the amount of discoloration, and the type of whole rice from which it came. Thus

"A-1 Super," the best grade of broken rice, is white in color, free of impurities, and has a grain size that is mostly from one-fourth to one-half grain. It is the graded residue from the milling of the highest grade of whole milled rice, while the lower grades of broken rice, such as "C-3 Special," are brown in color, have a very small grain size, and originate from the milling of low-grade rough rice and the production of the lowest grade of white whole rice containing 35 to 42 percent brokens. In 1948, broken-rice prices in Siam varied from about $6.00 per hundred pounds for the highest grade down to $3.00 per hundred for the seventh and lowest grade. These are prices for export dealers. Domestic prices for local use were at about half of the export price.

Because of unusually favorable climatic and soil conditions, rice can be produced in Siam (along with the other two important southeast Asia rice exporters - Burma and French Indochina) at least as cheaply, as it can in any other area in the world. The land is plowed in May, at the beginning of the rainy season, by the use of small wooden plows without moldboards which partially stir up the soil (figures 2, 3, and 4). In the lower areas and on the poorer soils, the rice is broadcast in June when the heavier rains begin. For the next 4 to 6 months the rains, the rising rivers, and water from the canals usually keep the rice fields flooded, thus only occasionally pumping is necessary.

Several varieties of rice are grown and most of the rice is harvested between November and January. It is cut by hand, shocked in areas near the farmstead or village, and threshed. In many cases the shocks are spread on a hard surface made from mud and manure and cattle are driven over the shocks until the grain is beaten from the straw. Others thresh the sheaves by whipping them into a basket or against a log. The threshed grain is winnowed, often with a wooden fanning mill. It is stored in bulk in bamboo bins for use on the farms or for sale.

The average farm family grows about 20 acres of rice. No fertilizer is used, but soil fertility is maintained by the annual silt deposits during the flood season. Farmers produce rice year after year on the same land, but let it remain fallow during the dry season. Especially in the lowest areas between the rivers, where floods are deep, no levees or bunds are used. The rivers usually overflow to about the same levels each year. For the transplanted acreage, only small infrequent levees are needed to hold the first rains so as to transplant the crop. The average labor requirement per acre under these production methods is estimated to be between 200 and 300 man-hours, and the total hours of work per member of the farm family is between 300 and 450 hours per year, or from 30 to 45 10-hour days.

About 15 percent of the rice produced in Siam is glutinous rice. This type is similar to United States short-grain rice, but it is even more glutinous and is used only for special dishes consumed mainly on festive occasions. Because of the fixed prices established by the Government during the past 3 years, which were the same for long-grain as for glutinous rice, the production of glutinous has been increasing and is likely to cause a serious marketing problem unless price differentials

are established. All of Siam's Asiatic markets desire a small amount of glutinous rice, but none need more than 5 percent of total deliveries of this type. Under the present pricing policy, Siam's producers have been expanding the production of glutinous rice because of higher yields relative to the usual long-grain types, and most of the importers complain of the relatively large supplies of this rice that are being delivered by Siam under the International Emergency Food Council's allocations. As rice supplies become more plentiful, an oversupply of glutinous rice is likely to occur in Siam.

In prewar days, Siam was the principal competitor of the United States in the supplying of long-grain rice to Latin America and Europe. In the near future, it is again likely to become our major threat in selling long-grain rice in export markets. Because other rice-consuming areas in Asia have not recovered as rapidly as Siam, it is likely that a relatively large share of the Siamese export surplus, which might move to Cuba or to Europe, will remain in Asia. However, while the danger is not immediate it nevertheless exists. On the other hand, as controls are relaxed, Siam is likely to seek those markets where dollar payments can be obtained since dollar exchange is badly needed for purchasing machinery and finished goods from the United States. This means that Siamese rice could conceivably move to Cuba and to Europe in a year or two, even though parts of Asia need rice desperately. In order to plan their production and marketing schedules with the greatest efficiency, United States producers and millers of rice should keep in constant touch with developments in Siam.

French Indochina

Total rice production in French Indochina for the 1947-48 marketing season amounted to 235 million bushels from 10.6 million acres. Production in 1948-49 is expected to be around 250 million bushels from a planted area of about 11 million acres. Prewar production (1935-36 to 1939-40) averaged 320 million bushels of rough rice from 14.3 million acres. Production prospects for the 1948-49 season are indicated to be about 75 percent of prewar - only slightly higher than in 1947-48.

French Indochina has not regained its prewar status in total rice area and production; and present indications are that it will not reach prewar levels of production within at least 2 years and most probably not within 4 to 5 years. Available export supplies are even lower than the total production estimates and will most likely continue to lag behind the total volume produced from year to year. During 1947, French Indochina exported only 125,000 short tons of rice and rice products as compared with the prewar (1936-40) annual average of 1.6 million short tons. Export supplies for 1948 are forecast at about 200,000 tons, less than 15 percent of the prewar average.

This decline in production and exports was the result of political developments that began during the war and were intensified during 1947 and 1948, rather than of a failure in the physical items needed in the production process or in some change in the capacity to produce. The

country has been governed by a Federation within the French Union and administered by a French High-Commissioner in Saigon. A native revolution, which started at the end of World War II, has been intensified in recent months, developing such force that the French have lost control of many of the rural areas. Although rice in large volume is being produced in the rural regions, these "unsettled conditions" are such that much of it cannot be transported to Saigon and milled for export. With the lack of demand at the farm level due to these conditions, many producers have restricted production to the amount needed for home consumption and local demands. They are not likely to resume full-scale production until there is a steady, reliable market for their surplus and incentive goods are made available to pay for the rice.

In addition to the reduction in deliveries of rough rice caused by the revolution, there has been wholesale destruction of rice mills in some areas. In the city of Saigon, the center of the milling and export area, there were 60 large, fairly efficient rice mills in 1940. On April 1, 1948, there were only 15 left. The remainder had been burned or otherwise destroyed. During the first 2 weeks of April, 3 more mills were burned by the revolutionists, leaving only 12 of the original 60 mills. Thus, milling capacity is not sufficient to process a volume of rough rice equal to the prewar level, and many new mills will have to be built before the prewar export quantity is regained.

In Saigon, most observers reported that the rice situation in French Indochina cannot be expected to improve materially until the "political difficulties" are settled. When and if this is accomplished, improvement will not come immediately. It will take at least 3 to 5 years to reestablish milling facilities and to build up confidence among farmers to the extent that they will produce and sell rice freely and in volume.

The population of French Indochina in 1948 was estimated to be about 24.3 million people, and it appears to be increasing at the rate of about 2 percent a year. Because of this rapid increase in population, any long-time expansion of rice exports above prewar levels does not appear to be possible, even with the settlement of the political difficulties. According to the French officials in Saigon, the history of French Indochina shows that the population rate adjusts itself to available food supplies and that innovations (such as large irrigation systems, new fertilizer methods, improved varieties, or other changes that increase rice production) have always been neutralized by a population increase that absorbs the extra surplus within 20 years. Because of this factor, the French report that there is little to be gained by establishing programs to improve rice production. They state that they can hardly regain the original capital investment before the increased population caused by the improvement begins to use up all the added production gained by the new development. Regardless of the validity of this argument, it is one of the factors that is likely to retard many governments and private investors in the Far East from making long-time investments that will increase the production of rice or other food crops.

All rice exports from French Indochina are under the control of the "Comite des Cerals de'Indochine" of the French Government. Rice for

export must be declared to this Committee, which issues export permits to each individual firm. Although the Government does not actually buy and resell the rice, as is done in Siam and Burma, it imposes three different taxes on rice for export. These are the special duty on all exports, amounting to 149 piastres per 100 kilos on milled rice and 114 piastres on broken rice; the exceptional tax on rice, varying from 170 piastres per 100 kilos for No. 1 milled rice down to 125 piastres for rough rice; and the harbor handling tax on rice with a rate of 0.32 piastres per 100 kilos for milled rice. These three taxes average about 11 cents per pound when converted from piastres to dollars at the official rate. Due to the weakness of the currency, however, the realistic conversion rate should be the unofficial or black-market exchange rate. On this basis, the total of these taxes would amount to about 3.5 cents per pound. However, even at this rate, the Government receives as much or more than the producer is paid for growing and marketing the rice.

In 1948, farmers in the rural areas were reported to be receiving about $1.25 per bushel, or $4 per barrel, for rough rice. The average price for rough rice delivered to the mills in Saigon, however, was $2.70 per bushel, or $9.50 per barrel. Due to inadequate transportation facilities and unsettled conditions, the farmers were being paid less for producing the rice than the costs of transporting the product from the farm to the mill.

The wholesale price of white milled rice in Saigon in April 1948 averaged about $8 per hundred pounds, and retail prices varied from 8 to 10 cents per pound. Although there are several hundred different varieties of rice produced in French Indochina, all are grouped into three general classes: (1) Long white rice (the long-grain varieties), (2) round white rice (the short-grain types), and (3) glutinous rice. About 30 percent of the total production is long white rice, 60 percent is round white rice, and 10 percent is glutinous rice. Within each type, there are four major grades of milled rice. These grades are No. 1, with a tolerance of up to 25 percent of broken grains of one-fourth to three-fourths grain size; No. 2, with up to 35 percent brokens; No. 3, with up to 55 percent brokens; and No. 4, which is broken rice. Much of the exports from French Indochina in the past have been "cargo" rice, which is hulled but unmilled rice. They report a milling yield of 70 percent when producing cargo rice from rough rice. Average milling yields from rough to milled rice are 64 percent whole milled rice, 8 percent bran, 5 percent polish, and 23 percent hulls and waste.

About 90 percent of the rice acreage in French Indochina is transplanted (see figure 7) irrigated rice and 10 percent is broadcast irrigated rice. Of the total cultivated land in the country, about 80 percent is normally planted in rice each year. This is the highest ratio in the world. No formal irrigation systems are used in rice production. Extensive rivers and canals cover the wide level plains uniformly with flood waters during the rainy season; and, for the most part, the farmers plant the rice and let the rains do the irrigating. The annual rainfall varies from 60 to 100 inches, and all of it falls during the 4- to 6-month rainy season. The usual seeding dates for the nurseries are May

and June (see figure 5); the usual transplanting dates, July and August; and the usual harvesting months, December, January, and February. As in other nearby areas of southeast Asia, the land is plowed with water buffalo and wooden plows; the crop is transplanted by hand; little weeding is practiced; and harvesting and threshing is done by hand. The only fertilization practiced is the occasional collecting of the masses of dead fish, when the waters recede at the end of the rainy season, and the spreading of these fish over the land.

In the narrow valleys of upper French Indochina as well as in Siam, an unusual type of rice, called floating rice, is commonly grown. In this area, where the flood waters come rapidly and rise to high levels, this rice is broadcast or transplanted when the first rains come and swiftly adjusts itself to changing water levels. As the flood waters rise, the plants grow apace, sometimes as much as 8 inches to 1 foot a day, up to a maximum height of 12 to 16 feet. One plot of this type of rice was observed in 12 feet of water. Later, as the floods recede, these plants collapse in the mud, take roots at each node, and the stalks then form heads and mature. The French report that this type of rice is of short grain and of poor quality but is valuable in regions where floods are a severe problem.

Although rice in French Indochina did compete in some years with United States rice in foreign markets in prewar days, it is not likely to do so in the next 3 to 5 years because of the unstable conditions. As in Siam and Burma, climate and soil are ideal for the production of cheap rice. If and when political conditions become stabilized, French Indochina can be expected to resume its prewar position, gradually, and reach annual export levels of around 1.6 million short tons.

Korea

Rice production in South Korea, the zone controlled by the United States, amounted to about 132 million bushels in 1947-48 from 2.75 million acres. Production for the 1948-49 season reached 154 million bushels, which slightly exceeds the 1935-36 to 1939-40 average for this part of Korea. The 1948-49 acreage will be about the same as for the preceding year; but the yield per acre, due to increased use of fertilizer, will be higher. The prewar production of rice in North Korea, the zone controlled by Russia, averaged about 46 million bushels on a rough-rice equivalent annually. The rice area and average yield in North Korea in 1947 was about the same as in prewar years, and in 1948 it was somewhat larger.

In contrast to the prewar period, when Korea exported an estimated annual average of 660,000 short tons of brown rice, South Korea, in 1947, imported 440,000 short tons of food (in terms of brown-rice equivalents) to supplement the domestic production. It is estimated that 250,000 short tons of food will be needed during the 1948-49 fiscal year in addition to the total production of rice and other foods within the South Korea area. If sufficient fertilizer supplies become available. South Korea may become self-sufficient as to food production in the period between 1950 and 1952, but it is not likely to become a major exporter of rice within the next 5 years.

This transition from a surplus to a deficit area in food production has been caused by a number of factors. South Korea is the densely populated agricultural part of the country, while North Korea is the industrial section, with adequate supplies of water power, timber, and some raw materials to maintain fertilizer plants and manufacturing industries. For the 40 years prior to the end of the war, Korea, as a whole, was controlled by Japan, and, in the more recent prewar years, it produced sufficient food for domestic needs and exported more than one-half million tons of rice annually. Under the Japanese, rice production in Korea was maintained and expanded by the use of fertilizer produced in the northern zone as well as fertilizer that was imported from Japan. Rice consumption within the country was held to relatively low levels by the substitution of imported foods - mostly millet and soybeans from Manchuria - for a part of the rice that was exported to Japan. Since the end of the war, the division of the country into the United States and Russian zones, with little or no commerce between the two, along with the reduction of fertilizer imports from Japan and a very unusual increase in the population has brought about an entirely new situation in South Korea.

The population of South Korea has increased more than 25 percent in about 2 years. In all of Korea, there were an estimated 25 million people in 1948. The population of South Korea, the United States zone, increased from 16.3 million in 1946 to 20.9 million by March 1948. This unusual increase was the result of the repatriation of more than 1 million Koreans from other countries, mostly China and Japan; the influx of about 1 million from the northern (Russian) zone; and a natural increase in excess of 2 percent per year. This population increase, plus the loss of food imports from Manchuria, has caused the consumption of food within the country to increase rapidly. The reduction of fertilizer imports, on the other hand, has caused food supplies to be less than those of prewar. Thus, South Korea has become an importer of food rather than an exporter of rice, and there is little likelihood that the industry can resume its prewar rice-export trade in the near future. This means that Japan, which once imported rice from Korea, must look elsewhere for its rice supplies.

About 450,000 short tons of fertilizer, mostly in the form ofammonium nitrate, has been imported into Korea during the past 2 years. This fertilizer, plus the distribution of other incentive goods to farmers and certain reforms in production and marketing, has been the major factor responsible for the increase in rice production in South Korea to the point approximating prewar levels. The imported fertilizer has been supplied to farmers at subsidized prices in order to stimulate rice production. Because of the temporary nature of the fertilizer imports and the funds used to finance them, the food-production capacity of South Korea is not secure at prewar levels and could drop sharply in any year when the subsidized fertilizer imports are not maintained. Practically all of the available cropland in South Korea is in full use, and little increase in production can be expected from an extension of the land area. The major method of maintaining and expanding present production

levels to some extent appears to be the increased use of fertilizer on rice and on second crops for the 50 percent of the land area that is double-cropped.

In prewar days, the major fertilizer used on rice throughout Asia was ammonium sulphate. It is applied primarily as a ground fertilizer just before the rice is transplanted. In contrast to nitrates, ammonium sulfate does not immediately become available under the flooded conditions of the usual rice paddy, but it is gradually available to the plants and does not leach out through the irrigation waters before the nutrients can be used. Thus, although ammonium nitrate, which has a 33-percent nitrogen content, is usually less expensive, per unit of nitrogen, partly because of savings effected in shipping a more concentrated product, it is less in demand than ammonium sulphate which has a nitrogen content of only 21 percent. In South Korea, however, at the end of the war, no ammonium sulphate was available and the major imports were of ammonium nitrate. The advisers to the South Korean Government found that, if ammonium nitrate was applied in three to four applications as top-dressing after the rice had been transplanted, the increased yield, per unit of nitrogen, was as good as that obtained from ammonium sulphate or any other fertilizer. With much difficulty, they proved this point to the Korean farmer, and, by 1948, ammonium nitrate was fully accepted by Korean farmers for use on rice. Numerous top-dressing applications by hand require much hand labor, but, in the many Asiatic areas where labor is available, this Korean experience indicates that the expanded use of ammonium nitrate offers an opportunity for increasing food production.

The revolutionary forces in South Korea have tried to undermine the confidence of the producers in this new fertilizer distributed by the United States. They collected a supply of empty ammonium nitrate sacks, filled them with caustic soda of a type that appeared similar to the fertilizer itself, and slipped the filled sacks back into the distribution system. They then spread the rumor that the United States was planning to starve out South Korea by killing the rice crop with bad fertilizer. In the cases where this substitute was used, the crop was destroyed. The trick came close to success, but it failed because the revolutionists exhausted their supply of caustic soda, and officials soon removed the existing adulterated supplies from the distribution channels.

South Korea has about 2.1 million farm families with an average of only 2.7 acres of arable land per family. About 50 percent of the land is double-cropped, being planted to rice from June to November and wheat or other small grains from December to May. In the summer season, rice is grown on 60 percent of the cropland; the winter climate is too severe to permit a second crop of rice and in part of the area is too severe even for wheat. As in Japan, rice is planted on every possible spot of land and is grown in spite of topography and climatic conditions. The country is rolling to hilly, and all the slopes are intensively terraced.

Practically all of the rice produced in South Korea is of the irrigated type. It is seeded in the nursery beds from May 1 to June 10,

transplanted by hand in the flooded fields from June 1 to July 20, and harvested in September and October (see figures 5, 7, and 8). As in Japan, the varieties grown are mostly short-grain and semiglutinous types, which are similar to our California varieties.

The rice crop is harvested by hand; shocked and hung on racks near the farmhouses to dry; threshed on the farm by hand or with the Japanese-type, foot-pedal, one-man, threshing machine; and hulled on the farm or in a nearby village. The crop is stored as husked (brown) rice and milled in small milling units in the consumption centers. The Korean consumer, like the Japanese, prefers his rice to be freshly milled. Rough rice and hulled rice is divided into three grades - first, second, and out-of-grade. There are only two grades for polished rice - first and out-of-grade. Under the present system of controls, rice farmers are required to sell all production above that computed for family needs to the Government at officially controlled prices. As the official price in 1948 was only about one-fifth of the black-market price, the tendency was for farmers to underestimate their production as much as possible so as to have a large supply to sell on the black market.

A rather unusual method of producing rice plants was observed in Korea. Because of the severe winters and the short growing season, the nurseries must be planted as early as possible, and frequent frosts can be expected after the seed germinates. To protect the growing plants, many producers flood the nursery every night to the extent that the plants are completely covered with water. The bed is then drained the next morning to prevent water-killing. The irrigation methods were equally unusual. Although much of the rice area is irrigated by simple gravity flow from terrace to terrace, in the lower levels some water must be lifted. Two important methods of lifting water were used. The most common was the "two-men-and-a-bucket" type. For this method, a large, sloping, wooden bucket, with a rope about 10 feet long tied to each side, was used. One man stood on each side of the ditch from which the water was being lifted, holding his end of the rope; and, with a continual swinging motion, the two dipped the bucket down to the lower water level on the downswing, swung it up to the upper level where the bucket tipped and spilled at the peak of the upswing; and then moved back for another dip.

The more advanced method, which is reported to have been in use for only a thousand years or so, was the "one-man, tripod-and-scoop" type. By this method, a tripod of tree limbs about 10 feet high is mounted over the spot where the water is to be lifted; a long-handled, scooplike wooden container is attached to a rope hanging from the center of the tripod; and the water is lifted with a pushing motion. The operator stood in the water to be lifted, pushed the handle end of the scoop down, dipped it full of water, and continued the pushing motion until the scoop reached the upper level where it was tilted sidewise to dump; then the scoop swung back by gravity to start the next dip, swing, dump, and back movement. This swinging scoop principle, with ropes tied to the scoop and pulled by men on the upper level, was also used to lift soil to level land and to build terraces.

Insofar as United States rice interests are concerned, South Korea offers neither competition nor possible markets in the next few years. The region is likely to establish self-sufficiency in food production but is not likely to become an exporter of rice in the near future. Because the country was an important exporter of rice to Japan in prewar days, however, the reduction in these exports points out the need for additional rice supplies for Japan from other sources. This indicates more clearly the possibility of developing United States rice markets in Japan.

THE DEFICIT-RICE REGIONS OF ASIA

The major regions of Asia that produce large volumes of rice but that also import varying quantities of rice to supplement domestic production include Japan, the Dominions of India and Pakistan, the Malayan Union, China, the Netherlands Indies, the Republic of the Philippines, Ceylon, and Hong Kong. Total rice production for the deficit areas of Asia averaged 5.9 billion bushels of rough rice annually from an average area of 156.8 million acres in the 1935-36 to 1939-40 period. More than three-fourths of the rice area and production of the world is in the deficit-rice regions of Asia.

In addition to domestic production, the deficit-rice regions of Asia imported an average of more than 6 million short tons of milled rice and rice products annually during the 1935-36 to 1939-40 period. This amounted to 70 percent of all rice moving into international trade channels. Relative to domestic production in the region as a whole, however, imports were only about 6 percent of total consumption. The annual domestic production of the deficit-rice regions of Asia averaged about 95 million tons of milled rice.

The loss of normal imports during the war years caused some countries in this region to expand the area planted to rice. In comparison to the 156.8 million acres planted in the prewar period, the total acreage for the 1947-48 crop year amounted to 163.8 million; and the acreage forecast for 1948-49 is 165.3 million, an area more than 5 percent larger than that of the prewar period. Most of this increase was in India and Pakistan. According to the official figures on total production, however, yields per acre did not keep pace with acreage expansion. Total production for these regions was estimated to be 5.7 billion bushels on a rough-rice basis in the 1947-48 season and is forecast at 5.8 billion bushels for the 1948-49 season. Thus, while the rice acreage is 5 percent greater than prewar, total rice production is indicated to be 2 percent less.

Due to shortages in the normal exporting areas, total imports into this region have been less than one-half of the prewar level. Imports amounted to only 1.5 million tons of milled rice and rice products in 1946 and 1.9 million tons in 1947. Imports into the deficit-rice regions of Asia accounted for about 65 percent of the total volume of international trade in rice in 1947. Recent trends in the acreage, production, and net imports of rice for the more important countries of the deficit-rice regions of Asia are presented in tables 5 and 6.

TABLE 5.- *Rice acreage and production in the major deficit-rice countries of Asia, averages 1935-36 to 1939-40, annual, 1946-47 to 1948-49*[1]

COUNTRY	1935-36 to 1939-40	1946-47	1947-48	1948-49[2]
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*
ACREAGE:				
India	54,105	60,987	59,656	61,000
China	48,161	45,165	45,373	45,617
Pakistan	18,686	20,959	21,156	21,457
Netherlands Indies	9,794	8,850	9,000	9,000
Japan	7,862	7,700	7,830	7,850
Philippine Islands	4,852	4,816	5,007	5,160
Malayan Union	746	797	862	900
Other deficit areas	12,651	15,828	14,898	15,763
Total (excluding USSR)	156,847	165,102	163,782	166,747
	1,000 bushels	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*
PRODUCTION:				
China	2,623,383	2,253,921	2,278,436	2,360,000
India	1,403,935	1,484,057	1,402,141	1,550,000
Japan	595,845	561,076	553,408	576,322
Pakistan	547,702	579,616	569,900	570,000
Netherlands Indies	313,144	270,000	275,000	275,000
Philippine Islands	104,877	107,689	109,782	119,000
Malayan Union	27,099	20,322	26,868	27,000
Other deficit areas	327,408	549,168	445,509	448,440
Total (excluding USSR)	5,943,393	5,825,849	5,661,044	5,925,762

[1] Crop year beginning August 1.
[2] Preliminary

Office of Foreign Agricultural Relations. Compiled from official and other sources.

TABLE 6.- *Net imports of rice into the major deficit-rice countries of Asia, calendar years, average 1936-40, annual 1946 and 1947*

COUNTRY	AVERAGE 1936-40	1946	1947
	Short tons	*Short tons*	*Short tons*
Japan	1,945,382	17,152	3,307
India[1]	1,552,235	312,852	560,928
Malayan Union	688,196	2,111	266,420
China	425,077	229,220	335,555
Netherlands Indies	202,690	-	107,802
Philippine Islands	64,775	129,118	79,948
Other deficit countries	1,074,053	862,087	546,296
Total (excluding USSR)	5,952,408	1,522,540	1,900,256

[1] Including imports into Pakistan.

Office of Foreign Agricultural Relation. Compiled from official and other sources.

The deficit countries of Asia were the most seriously affected by the world decline in rice production during the war years. Since rice makes up about 80 percent of the calories in the normal diet of most of the population of this region and per-capita consumption rates averaged about 300 pounds per year when supplies were available, this shortage of rice brought about a critical food-deficit problem. Although the statistical picture indicates that the situation was serious enough to cause widespread famine in many areas during the 1946 to 1947 period, famines in the region as a whole were not more serious than in the prewar years.

The indicated reasons for this paradox are many. Of some importance in explaining the situation is the observation, after the detailed survey of these regions, that the official data as to total production of rice understate the actual production. Under the IEFC rice allocations, it was to the advantage of each deficit country to release as unfavorable a picture as possible of the total domestic food supplies in order to obtain a large share of the available export supplies. There appears no doubt that some of the official production figures for some of the countries understate the true production by as much as 10 percent. If this were not the case, many more people in these countries would have starved during the 1945-48 period. Production specialists in some of the countries of this region felt that total production of rice had increased at least in proportion to the acreage increase, and perhaps more.

With the exception of Japan, the countries of the deficit-rice regions of Asia have never used significant quantities of commercial fertilizer on the rice crop. Thus, rice yields have not declined because of fertilizer shortages. Also, weather conditions in the 1945-48 period have been as favorable as the average of the prewar period. These facts, together with the indicated cultural improvements in some countries and wider use of improved varieties, lead to the conclusion that average yields per acre in the immediate postwar period have been as high as those obtained in the prewar period.

In addition, many of these countries have expanded the production of substitute food crops to replace the rice deficit. The production of vegetables in the Philippines is reported to be four times as great as it was before the war. Wheat production has been expanded in central China and sweetpotatoes in south China; and larger quantities of small grains, vegetables, and sweetpotatoes are grown in Japan. The use of millet as a food has been expanded in India, and many of the regions are making greater use of various root crops in their diet. Also, large quantities of wheat and other foods have been imported into some of the deficit countries in recent years, especially into Japan, China, and Korea. In some countries, such as the Malayan Union, the general feeling is that this forced change in food habits is a temporary one and that the people will revert to a straight rice diet as soon as sufficient supplies are available. In others, such as the Republic of the Philippines and in Japan, the reaction of most observers is that the per-capita consumption of rice will never go back to prewar levels.

Not only are the official figures for domestic production understated, but official import data are likely to understate quantities of rice

actually received. Due to the system of government-to-government rice exporting and importing now followed in most of this region and the high profits obtained by the exporting governments, wholesale smuggling has been prevalent in many of these regions. There appears to be little doubt that some rice that did not show up in the official export figures has moved from Burma to India, from French Indochina to China, and from Siam to both of these major importing areas as well as to Java, the Malayan Union, Hong Kong, and other regions. For the past 2 or 3 years, this unofficial movement has amounted to at least 500,000 short tons annually. Thus, the deficit regions of Asia have been importing about 25 percent more rice than the official data record.

These observations indicate that, although the deficit-rice regions of Asia are short of rice, their position is not as serious as some recent press releases would lead one to believe. These countries are likely to regain levels of imports sufficient to meet all requirements sooner than is commonly believed, and, due to increased consumption of substitute foods, they may never require rice imports as large as those obtained in the prewar period.

Due to the rapid increase in population that is occurring in this region, there appears to be little chance that it will become completely self-sufficient in food production. Increased production of rice and the expanded use of substitute foods, however, are likely to keep pace with the increasing population. Thus, long-time import demands for rice from the deficit-rice areas of Asia are indicated to be no more than normal prewar imports, and the total volume could be less.

The only two countries of this region that offer possibilities of developing into long-time markets for United States rice are the Republic of the Philippines and Japan. The Philippine population prefers a long-grain, hard type of rice. They do not object to a relatively large percentage of broken grains but do prefer that their rice be highly milled, completely white in color, and free of all impurities. On the other hand, the Japanese consumer wants short-grain rice, and he prefers to import it as brown or hulled rice rather than polished rice. Since these two countries have closer financial ties with the United States than the other countries of the region and do need import supplies of rice, it would be to the interests of the United States rice industry to explore all possible means of establishing export markets in these countries.

With the exception of certain areas in India, none of the deficit-rice countries of Asia like or want parboiled rice. United States parboiled rice delivered to some of the countries of this area in recent years has done the industry more harm than good. Many of the countries are now skeptical of all United States rice, and these doubts can be cured only be delivering to them the quality and type of rice preferred by their consumers.

From a nutritional standpoint, the advantages of shipping parboiled rice to Asia are not as great as one would imagine. Although parboiled rice does have certain nutritional advantages over highly milled, raw rice, it does not have these advantages over hand-pounded or hand-milled rice. More than two-thirds of all the rice produced in the deficit

regions of Asia, which means more than one-half of all the rice produced in the world, is hand-pounded or hand-milled on the farms and in the local areas where produced. Thus the rural natives obtain vitamins from the hand-pounded rice. Since most imports to these countries are consumed in the large cities where diets are more varied, the need for the vitamins is not so great. In any event, most Asiatics do not like the odor or taste of parboiled rice, and consumer preferences are not easily changed.

In recent years, numerous suggestions have been made for increasing the production of rice in the deficit-rice regions of Asia in order to improve standards of living. The most frequent of these include: (1) Mechanization, (2) improved irrigation facilities, (3) expanded use of commercial fertilizer, (4) expansion of breeding and selection work to develop higher yielding varieties, (5) modern milling machinery, (6) improvement of transportation facilities, (7) parboiling the crop so as to increase milling yields, and (8) improved storage facilities.

Of all these suggestions, the indications are that the expanded use of fertilizer offers the most promise for the region as a whole. It is practical, gives immediate results that can be seen by the producer, and is cheaper in the long run than many of the other ideas. Contrary to popular beliefs, mechanization offers the least opportunity. Mechanizing Asiatic rice would change the common practice of transplanting to broadcasting. Although transplanting requires more hand labor, it permits the Asiatic farmer to grow two crops a year on most of his available cropland by delaying the transplanting of rice until a winter-grown crop is mature (see figures 6, 7, and 8). Broadcasting would require that this land be fitted 2 months earlier and would eliminate the winter crop. With a large supply of labor and a shortage of food, the deficit regions of Asia are better off with a winter crop of wheat or other food crop and a summer crop of rice than they would be with only one crop of rice each year, even if it were produced cheaper by mechanized methods. Also, yields from broadcasted rice are lower than from transplanted rice. In addition, mechanization is profitable only when farm labor is scarce and expensive; these conditions do not exist in most of Asia. The most important piece of machinery needed in most of the deficit-rice regions of Asia is a good wheelbarrow, preferably one with a steel wheel and a rubber tire. Gasoline-powered equipment is an interesting toy for the local politician in most of the areas of Asia; but it is too expensive to be practical under the existing conditions on most of the farms.

Of the other suggestions, improved transportation facilities offer the best opportunity for local governments to develop rural areas. The farmers share of the consumer's dollar is only about half as much in most areas of Asia as in the rest of the world partly because of inadequate marketing facilities, particularly transportation. Irrigation developments offer only limited promise in most areas because most of the rice crop is produced under conditions of natural rainfall, and most irrigation projects that are proposed for rice are actually intended for use in expanding certain export crops designed to profit only a few individuals rather than in improving the standards of living of the masses.

FIGURE 5.- Pulling rice seedlings from a nursery bed in Japan. About 40 days afte seeding of the nursery bed, the plants are pulled, pruned, and tied into small bundles to facilitate handling.

FIGURE 6.- Wheat shocks drying on the levee (bund) while the paddy is being prepared for the transplanting of rice in Japan. Much of the cultivated land in Japan is double-cropped. Wheat in winter and rice in summer is the rotation most commonly practiced.

FIGURE 7.- Transplanting rice in Niigata Prefecture, Japan. This scene, showing many small paddies, is typical of the lowland rice areas of Asia.

FIGURE 8.- Close-up view of the transplanting of rice in Japan. About three to five plants are set in each hill. The hills are spaced about 8 inches apart, and the planting is check-rowed to facilitate cultivation and weeding.

Improved varieties would help, but much work has already been done on this problem. The greatest drawback here is the reluctance of local communities to adopt new varieties. In almost every community in Asia, the natives prefer the taste of their local variety to the exclusion of all others and are likely to continue to plant it, even if other varieties will bring a 50-percent increase in yield. Thus, there are at least 7,000 different varieties of rice now being produced in Asia with little possibility of reducing this wide range in the near future.

The milling method used on the farm, the hand-pounding process, has been used for thousands of years. It produces a nutritious product and is an efficient use of cheap family labor, which would otherwise be idle. Commercial milling in most areas is fairly efficient. Parboiling is not feasible because of consumer objections, and, since most of the rice is stored as rough rice, losses in storage are relatively small in the deficit areas.

China

Total rice production in China Proper for the 1947-48 marketing season amounted to about 2.3 billion bushels of rough rice. This crop was harvested from an area estimated at 45.4 million acres. Production in 1948-49 is estimated to be about 3 percent larger than for the preceding season. Prewar production (1935-36 to 1939-40) averaged about 2.6 billion bushels annually from an average of 48.2 million acres.

In spite of an average prewar production level of more than 2½ billion bushels of rice from an annual area of almost 50 million acres, China Proper (including the 22 provinces but not including Manchuria or Taiwan) was a deficit-rice producer and imported about 850,000 short tons of clean rice annually during the 1931-37 period. In 1947, imports amounted to only 335,000 short tons of cleaned rice, or about one-third of the prewar average, and 1948 imports were not materially above the 1947 level.

The population of China Proper is now estimated to be about 450 million as compared with 415 million to 425 million in the prewar period. Thus, there are apparently more people to feed with lower rice supplies than in the immediate prewar period. Total food production, however, including wheat, legumes, sweetpotatoes, and vegetables and other foods, as well as rice, is indicated to be at about prewar levels. Although there are many distribution problems and much instability is caused by the current civil war, food requirements in China Proper are indicated to be at a level somewhat similar to that existing in prewar days, rather than significantly higher, as has been indicated by some reports. Food supplies, including all types, are also indicated to be almost as high as the prewar level. Thus, assuming that no more than prewar levels of living are maintained, the overall food situation in China Proper is about the same as in the 1931-37 period.

Because of the long-existing problem of inadequate transportation facilities, the current instability caused by the civil war, and the resulting lack of faith in the monetary system, local food shortages

still exist in some areas of China Proper. These shortages are likely to continue to exist, and perhaps become more intensified, until the war is ended and adequate transportation facilities are established. As an indication of this problem, Chinese officials report that it is cheaper to buy rice in Burma or Siam and ship it to Shanghai that it is to go into surplus-rice-producing areas within 25 to 50 miles of Shanghai and attempt to purchase it from producers and transport it to the nearby city (figure 9). In May 1948, rice farmers in a region only 20 miles from Nanking were receiving $CN 140,000 per picul for rough rice, which at the current exchange rate amounted to about 30 cents per bushel, while rough rice in the city of Nanking was selling for $1.50 per bushel.

In addition to the rice production of China Proper, the Nationalist Government of China now has available the surplus production of Taiwan (Formosa), which was given to China at the end of the war, after 40 years of control by the Japanese. In the immediate prewar period, when Taiwan was under Japanese control, the average rice production amounted to about 1.4 million short tons in cleaned-rice equivalents. Of this amount, the 6 million people on the island consumed about 850,000 short tons annually and 550,000 short tons was exported, mostly to Japan. Although production estimates on Taiwan have been difficult to establish since the end of the war, most observers state that Taiwan is still a surplus-rice producer and that more than 400,000 short tons of clean rice were moved from Taiwan to China Proper in 1947. Indications are that the surplus rice production of Taiwan has contributed significantly to the solution of the deficit food problem in China Proper, and the proper development of Taiwan offers the best possible long-time solution to this problem.

Taiwan has a climate favorable to rice production, and two crops can be produced annually on most of the rice land. The first crop, which is seeded in the nursery beds in February, transplanted in March (figures 5, 7, and 8) and harvested in June, ordinarily makes up about 45 percent of the total annual production; and the second crop, seeded in June, transplanted in July, and harvested in November, accounts for 55 percent of the total crop. Rice yields per acre in Taiwan have been relatively low since the end of the war, due to the shortage of fertilizers which in prewar years were brought in from Japan. Total acreage has increased because of the substitution of rice for sugarcane on some of the cropland. With proper incentives to producers, with planned and organized land-use patterns, and with the availability of sufficient water for irrigation, Taiwan could possibly produce all of the rice needed in the deficit city areas of China Proper.

Some interests in China, however, appear to be planning the expansion of sugar production on Taiwan. Under Japanese control, the total sugar production on Taiwan averaged 1.3 million short tons annually in the 1935-39 period and reached a peak of 1.7 million short tons in 1939. During the war, production dropped to about 360,000 short tons annually and remained at that level through 1948. Certain plans have been prepared suggesting the rebuilding of the industry up to the prewar peak and even higher, or up to 2.8 million short tons annually, in order to export sugar to gain foreign exchange.

The net food shortage in China Proper is estimated to be from 1.0 million to 5.5 million short tons annually, depending on which official one talks to and upon what time of the day it is. In view of the hidden imports from Taiwan and the fact that there were no more famines than usual reported in 1947 and 1948, and with total food production about 1 percent less than prewar and reported imports only one-third to one-half of prewar, the lower estimate appears to be the more realistic one. Production data and food needs in China, however, are based more upon observations than upon established facts since accurate statistics are not available.

Under the program of the China Relief Mission, supported by United States aid, a food-rationing program was installed early in 1948 in the five major cities in China. In three of these cities where the rationing program was studied in detail - Canton, Nanking, and Shanghai - much of the rice supplied was from the United States (figure 10). In general, the program appeared to be working well. It was based on the allocation of 1 tou (17.2 pounds) of rice or flour equivalent per person per month. The price charged the consumer was set each month at 95 percent of the open-market price during the last 5 days of the preceding month. Since currency inflation was proceeding at a rapid pace (a U. S. dollar bought $800,000 CN on May 1, 1948, $1,200,000 on May 15, and increased to more than $10,000,000 CN by August 1), the open-market price for rice advanced rapidly during the month, while the rationed price remained stable. Thus, there was a great demand for rationed rice toward the end of the month, in spite of the fact that the people did not like the quality of the United States rice that was being distributed. The objective of this rationing program was to supply about half of the monthly needs of the consumers at relatively low prices in order (1) to prevent abnormal price increases and stabilize food supplies in cities where there are usually serious difficulties in the short-season (spring and summer) months, and (2) to prevent abnormal withdrawals of food from rural areas so as to maintain more adequate supplies there. Some mistakes were made and some inequities still existed in the program as it was observed in May 1948, but the over-all program, in general, appeared to be accomplishing its major objectives.

A most difficult problem in the rationing program was that of getting the people in the cities to consume the American rice that was being shipped to China in 1948. All of the United States rice that was observed being unloaded from ships, stored in godowns, transported to retail rice shops, and sold to consumers was unpolished or undermilled and labeled grades four, five, and six (mostly five), or it was parboiled rice. Due to the very high percentage of red rice in some of the United States supplies, Chinese consumers frequently inquired as to how United States millers managed to dye or color some of the grains red without damaging the remainder.

The most serious aspect of this matter was the fact that the quality varied so widely from shipload to shipload and from sack to sack within the shipment. In one shipment of less than 5,000 tons, for instance, there were at least 11 different types or grades of this undermilled rice, and most of them were equally bad. In this individual shipment,

there were numerous sacks of a very unusual type of American rice - a mixture of about 60-percent bran and 40-percent broken grains. Even the Chinese refused to buy this rice at any price. Also, the fact that the United States shipments were of undermilled or unpolished rice, while consumers in the large cities of China have always used highly polished rice, made it difficult to obtain acceptance of the rice. In addition, most of the American supplies were the short- and medium-grain types, while the Chinese consumer prefers long-grain rice. Because of these difficulties, the term "American rice" in these major Chinese cities was being closely identified with a poor-quality greatly variable product.

The parboiled rice delivered to China presented a special problem. The Chinese people did not like it because of (1) the yellow color, which has long been associated in China with poor-quality spoiled rice, (2) the taste and smell, which are different from any other rice that they have ever used, (3) the fact, as they have reported, that parboiled rice does not swell up as much when cooked, thus creating the feeling that this rice will not "fill you up" as much as a given unit of raw rice, and (4) their reported experience that when cooked according to the usual methods of cooking in China, parboiled rice becomes a sticky, gluey mass. In spite of the food shortage in China, it appears that much of the parboiled rice shipped to China in 1948 was finally consumed as chicken feed. The additional vitamins in this rice will not show up in improved nutrition for the Chinese people but will show up many years later in some of those "100-year old eggs" that are sold on the streets.

From the long-time viewpoint, there would appear to be little hope of a market for United States rice in China, due to the lack of purchasing power and the shipping distance involved. Thus, United States rice will move to China only as long as it is purchased with United States dollars under various aid programs. Since the objective of these aid programs is to help the masses and since this can be done more effectively by shipping larger volumes of a lower quality product, the shipment of low-quality rice to China seems to be justified. However, some of the 1948 shipments were widely variable in quality, and some were unfit for human consumption even in China. As a result, it was difficult to distribute and did more harm than good to United States-China public relations. Based on this experience, it would seem wise to take care that future shipments are at least uniform in quality, so that the consuming population can become familiar with a given type. Such a policy would help to assure the use of this rice by the people who need it, as there appears little chance of teaching the Chinese consumer to eat parboiled rice in time to help the present generation.

Rice production in China covers a wide area and is too varied to be classified as one general method of production or one type of culture. There are four major types of rice cropping, with many other variations in different areas. In parts of South China and in Taiwan, two crops are grown consecutively, each year. The first crop is planted in March, transplanted in April, and harvested in July; and the second crop is usually planted in June, transplanted in July immediately after the first crop is harvested, and harvested from August to October. In other

parts of South China, two consecutive rice crops are grown, but the interplanting of early with late varieties is practiced so as to stagger the harvesting season and utilize the available water to a greater extent. This practice involves the transplanting of alternate rows of early and late varieties or the transplanting of late varieties in the flooded fields where early varieties are already growing and maturing. A third general method of culture, which is practiced where the climate does not permit two complete crops annually, is a single crop of rice with the interplanting of early and late varieties, thus utilizing the 6- to 8-month growing season to the fullest extent. In the period when rice is not grown, the fields are planted to such dryland crops as wheat, rape, broad beans, forage crops, and vegetables (see figure 6). The fourth method of culture, which is predominant in the central valleys along the northern edge of China's rice belt, involves the growing of a single crop of rice in the summer months and a crop of winter grain, mostly wheat, during the winter. In this region, the rice crop is planted and transplanted from April to June and harvested from August to October.

In much of the rice area of China, the crop is grown in spite of climatic and soil conditions. Since rice produces more calories per acre than any other crop that can be grown in the region, it is planted under conditions that would be considered impossible in less densely populated countries. Although there are wide flat plains in parts of South China similar to the rice areas of southeast Asia, most of the region is rolling to hilly, and the land is intensively terraced into many small irregular plots (see figures 7 and 11). Most of the region does not receive the abundant monsoon rains of the surplus-rice-producing countries, and, for this reason, the water must be pumped from surface streams to maintain the rice crop. Many different methods of lifting water are used, but the most common is the farm-built foot-pedal irrigating machine (see figure 2). This piece of equipment is built from wood, bamboo, and rice-straw rope; and it is light enough to be moved from terrace to terrace by one man. It is composed of a long narrow wood trough from 20 to 40 feet in length, about a foot wide and a foot deep. Moving up this trough is part of a wood and rice-straw circular chain with paddles about every foot that fit into the trough. This circular chain is attached to a roller on the upper end of the machine by means of wood gears, and on the roller there are several footrests similar to the spokes of a wheel. The power, when applied to these foot pedals, turns the roller, which, in turn, moves the circular chain up the trough, pulling the water from the bottom of the lower terrace or stream up to the field being irrigated. The power is human and it is contributed mostly by women, who mount the foot-pedals on the roller and stride up and down with a movement similar to that used when riding a bicycle. The more typical machines have positions on the roller for two people, but, on the larger and more highly mechanized farms, there are four and sometimes six people operating one of the larger machines. A more modern version of this machine, which was in use on some of the farms, had a more elaborate wooden-gear arrangement attached to a water buffalo for power; these outfits, however, were not movable, and they

were used only for the permanent first lift from the stream to the lowest terrace in the field.

Throughout the country, the rice crop is seeded in nurseries, transplanted by hand about 40 days later, and harvested by hand (see figures 5, 7, and 8). Because of the intensive cropping necessary to maintain food supplies for the population, at least two crops are grown on all of the land in South and Central China. As a result, soil fertility is a major problem. Very little chemical fertilizer is used in China, but the many native fertilizing methods appear to be maintaining crop yields. The growers dig out the mud from the sides and bottoms of all nearby streams. This mud is carried in straw baskets and spread by shovel over the surface of the fields, each spring, before the rice crop is planted. In many areas, each farm is equipped with numerous compost holes in which all available organic material is deposited during the year and then carried out to the fields at planting time. In other areas, where there are hillsides not suitable for cultivation, the farmers cut off the sod in strips, peeling the entire mountainside; the sod is then spread over the fields. All available weeds, grass, straw, and leaves are also used in this way. Wood ashes saved from the home-cooking operation make up the major fertilizer application for the rice nurseries. Finally, the farmers have a common practice of applying all available "night soil" to the land; and, near the large cities they follow a practice of going into the city each day, purchasing the accumulated material from the different households, and carrying it out to the farms in buckets attached to bamboo poles. In addition, such cover crops as broad beans and clover are planted every few years and plowed under to build up run-down fields. Under such fertilizer practices and in spite of the production of two to three crops a year every year for hundreds of years, rice yields in China average about 50 bushels, or 14 barrels, per acre and appear to have changed little in the past 50 years.

About 85 percent of the rice crop in China is consumed in the local areas, where produced, and 15 percent moves into commercial channels for sale in nearby cities. Of that remaining in the local areas, 60 percent is consumed on the farms (figure 12), 25 percent is paid to local landlords as rent, and the residue is paid to labor or saved for seed. Most of this local rice is hand-pounded or hand-milled, with the use of the hand mortar and pestle or simple machines based on this principle. The rice sold for city consumption is transported as rough rice by human carriers or by hand-operated boats and is milled in many small Japanese-type rice mills located in the consumption centers. Milling yields are reported to average 70 percent for the country as a whole. With the exception of small amounts of glutinous rice, which are consumed on certain festive occasions, the general type of rice produced is similar to the medium- and long-grain types produced in the United States.

Japan

The 1947-48 rice crop in Japan amounted to about 553 million bushels of rough rice and was produced from 7.8 million acres. This compares

FIGURE 9.- Rice from Siam being delivered to a retail shop in rural China. These coolies carried the 100 kilo (220 pound) sacks of rice from a river barge about one-half mile away.

FIGURE 10.- United States rice, unloaded at the dock in Shanghai, is being carried by coolies to the nearby warehouses (godowns).

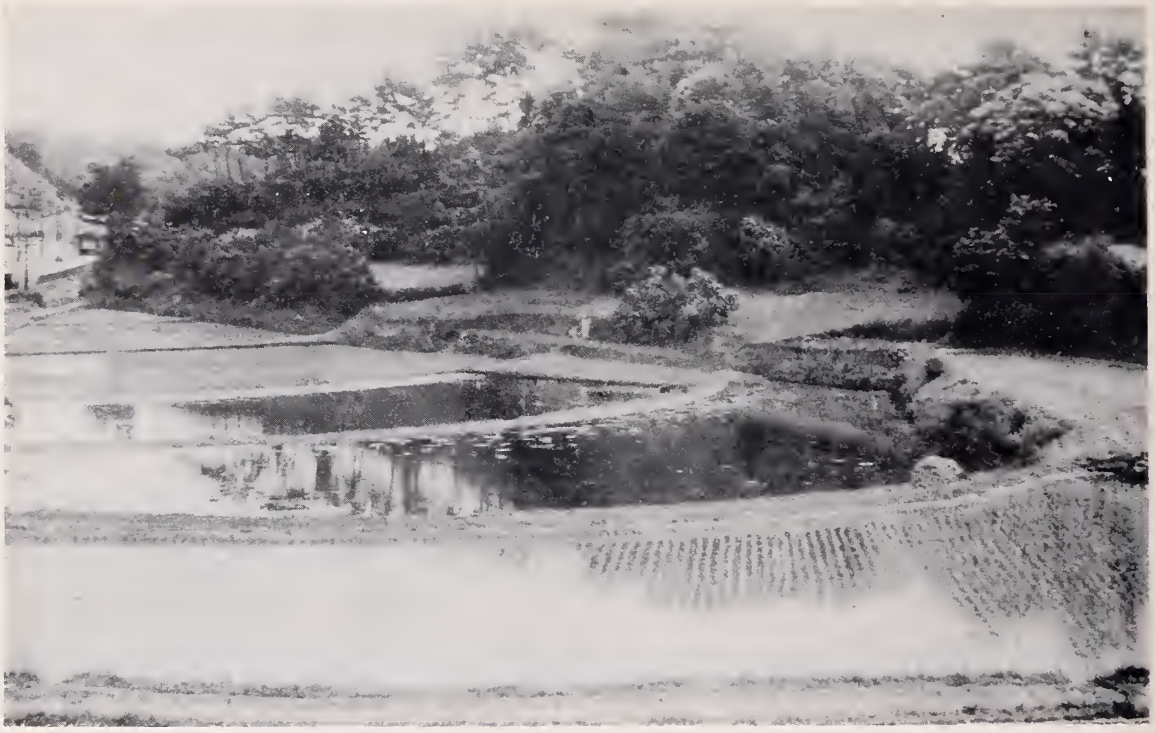

FIGURE 11.- Terraced rice fields in Japan. Owing to the rolling-to-hilly terrain of most of Japan, the hillsides are terraced to form small fields. Irrigation water is obtained from the natural flow from the hills during spring and summer rains.

FIGURE 12.- Cleaning rice on a farm in central China. This hand-operated fan mill is farm-made and represents the most advanced farm mechanization observed in the rice area of central China.

with an average of 596 million bushels grown on about 7.9 million acres as the average annual production for the prewar period, 1935-36 to 1939-40. Estimated production for the 1948-49 season is 576 million bushels from 7.9 million acres of land, or about the same acreage (and only slightly lowered total production) as was obtained in the prewar period. The lower-than-average yields obtained in the immediate postwar years are the result of reductions in the use of fertilizer, caused by the destruction of fertilizer plants. With the rebuilding of these plants, yields per acre can be expected to increase to prewar levels by 1950.

In spite of the fact that it is the third-largest producer of rice in the world, Japan has historically been an importer of food. In the prewar period, imports of rice amounted to about 110 million bushels, on a rough-rice basis, annually, or about 16 percent of the total consumption in the country. Before and during the war, Korea and Taiwan (Formosa) provided most of this deficit. Other important food imports were sugar from Taiwan and soybeans from Manchuria. For the next few years, at least, it probably will be impossible for Japan to obtain food imports from these countries. Land resources in Japan are now being utilized to the maximum, and, although improvements in production and distribution now being instituted will bring about some increase in output, this gain is likely to be offset by an increase in population. For these reasons, shipments of food from the United States or other surplus food areas will probably be needed for some years to come.

The population of Japan is now about 81 million people, and it is increasing at the rate of more than one million a year. On the basis of the average caloric intake of the Japanese people before the war, the net food requirement for human consumption during the next 5 years is estimated at about 20.9 million short tons per year in terms of brown-rice equivalents. The total food production of Japan is now about 16.5 million short tons, leaving an annual deficit of more than 4 million tons of food. Even at the 1948 level of consumption, which was about 85 percent of prewar, there still will be an annual import requirement of about 2.5 million short tons of food in brown-rice equivalents in the 1949-51 period. This would appear to be the absolute minimum needed to maintain the population.

Japan has been a heavy consumer of rice for many years. The prewar per-capita consumption was in excess of 300 pounds per year. The Japanese prefer the short-grain, semiglutinous varieties of rice to the long-grain, hard varieties, which bring a price premium throughout most of the rest of the world. The reasons given by Japanese consumers for their preference are: (1) These types of rice are more glutinous and stick together to a greater extent when cooked; (2) short-grain rice does not swell up as much when cooked; (3) it cooks better than other types; and (4) it tastes better. These are the identical reasons given in the Philippines, Siam, the Malayan Union, French Indochina, Hong Kong, and China for the preference for the long-grain nonglutinous types of rice, and they are similar to the arguments given by rice consumers throughout most of the Western Hemisphere for their preference for long-grain rice. Regardless of the reasons for certain consumer preferences,

these requirements are not likely to be changed in a few years, and United States producers who hope to establish markets for rice in Japan should recognize this special preference (which is contrary to that of most of the rest of the world) in planning their marketing program.

There is a definite market for large volumes of food in Japan for the next few years, and probably for many years to come, since any increase in internal production will probably be offset by an increase in population. Because of the responsibility of the United States in rebuilding the country, it is reasonable to expect that some of this market will be available to United States producers; but whether this food will be rice or some other food product remains to be seen. However, the normal source of rice for Japan is southeast Asia, and the country is likely to purchase most of its rice from this area when supplies are available.

The Japanese people have been forced to change their diet somewhat as a result of the war. In June 1948, for instance, the population of Tokyo was receiving a 10-day ration of rice, a 5-day ration of sugar, a 3-day ration of dried prunes, and some wheat flour and other miscellaneous foods to complete the ration for the month. This forced change in food habits may affect the future diet. In discussing this point with consumers, some of the younger Japanese expressed a preference for more "good American flour or wheat." They have had ample opportunity to sample United States wheat since the end of the war but have had no imports of rice from any source.

For the most part, however, the Japanese people still prefer rice of the short-grain type to any other food, if they can get it. This preference, coupled with the fact that there appears little chance that Japan will become self-sufficient in food production in the next 10 years, indicates the possibility of developing a good long-time market for United States short-grain rice in Japan. When interviewed on this subject, most of the Japanese consumers and Government officials stated that, if they could get short-grain, United States rice delivered in Japan at the same price as Siam long-grain rice, they would much prefer the United States short-grain rice and might even pay a little premium for it. On the other hand, they stated that they would be forced to buy wheat in place of any type of rice, if the price level of all types of rice was such that the price of brown or hulled rice was more than 20 percent higher than the price of wheat.

The taste preferences of the Japanese are such that they hull their rice immediately after harvesting and then store it as husked or brown rice, rather than as rough or milled rice. They do not like milled rice which has been stored for any length of time, preferring that it be milled or polished just prior to consumption. As a result, the rice-milling industry of Japan has developed as a large number of small-capacity mills, located near consuming areas and in most cases operated in connection with the local retail outlets. In this manner, the consumers are assured of freshly milled rice. Most of these mills have a capacity of from 1 to 3 tons of brown rice a day, but they are cleaner and more efficiently operated as a rule than the mills observed elsewhere in Asia. Average milling results for the usual short-grain round

rice produced in Japan are 73.7 percent for rough rice converted into completely polished or highly polished rice, 77.1 percent for rough rice converted into half-polished or undermilled rice, and 91.7 percent for brown rice converted to highly polished rice. Because of this preference for freshly milled rice, any United States attempt to develop long-time rice markets in Japan should be based on the delivery of husked (brown) or unpolished rice to Japan rather than polished price.

About 97 percent of the rice acreage in Japan is irrigated and 3 percent is dryland upland rice. Most of the crop is seeded in small nurseries in April and May, transplanted by hand during June and July, and harvested during September and October. The terrain of most of the islands is rolling to hilly; the average farm is about 3 acres in size; and the rice fields are terraced into many small irregular plots, averaging less than one-fifth of an acre in size (see figure 11). In contrast to China, very little water is lifted by mechanical or human means. Most of the irrigation is of the gravity-flow type which utilizes the run-off of spring and summer rains from the hillsides by an intensive system of terraces, supplementary dams, and small canals. The plants are produced in heavily fertilized nursery plots, transplanted about 45 days after seeding, and intensively weeded and cultivated during the growing season. In northern Japan, warmed seedbeds are used in order to produce early plants and take advantage of the entire period of the short growing season - the most common method being to prepare a layer of fresh humus under the seedbed, place a frame and oiled-paper cover over it, and apply heat by electricity. The rice lands are fertilized both before setting and by top-dressing. The average fertilizer application amounts to 900 pounds of mixed chemical fertilizer per acre, in addition to the large amounts of local organic fertilizers that are used, such as "night soil," weeds, and other organic residue. With this use of fertilizer, yields average about 70 bushels per acre in spite of the year-to-year production of rice on the same land and the growing of two or more crops a year on all of the available cropland (usually rice in the summer and wheat in the winter) in central and southern Japan (see figure 6). From three to five rice plants per hill are set in very uniform rows about 8 to 12 inches apart (see figure 8). These are cultivated in the water by means of small, hand-operated, rotary hoes which are pushed through the water. This unusual cultivation practice is done to control weeds and pack the soil around the roots of the plants to encourage tillering.

After years of intensive research, Japanese scientists have discovered that the nitrogen content of "night soil" produced by European races is about double the nitrogen content of that produced by Asiatics. Judging by the demand for this product in the areas occupied by United States forces, where it is the major source of supplemental income to the servants of the homes and buildings, our forces are making a substantial byproduct contribution to the expansion of food production in Japan. Prices paid by farmers for this product amounted to about 8 cents per gallon in June 1948. The farmers interviewed who were using this product had the usual complaint of farmers throughout the world when talking about fertilizers; they said that the producers were now putting too much filler in it.

There are about 200 major varieties of rice produced in different parts of Japan, and an additional 800 varieties of minor importance are grown in local areas. Practically all are of the short-grain type similar to those produced in California. The Japanese stick to the short-grain types because of the higher yield obtained and the relatively short growing season required. These qualities permit the production of short-grain rice in areas with a climate similar to that of the States bordering on the Great Lakes as well as the practice of double-cropping in regions where the climate is less severe.

The rice is harvested by hand, tied in bundles, and hung up in racks in the field or near the farmhouse (see figure 6). After drying for several days the rice is threshed. The threshing is done either by hand or by using small foot-pedal threshing machines operated by one man. The crop is hulled, immediately after harvest, in small electrically operated hulling machines, which are located on most of the larger farms and in all of the villages. It is stored in rice-straw sacks in local warehouses or on the farms (Figure 13). The weaving of rice-straw sacks, for use in storing and transporting rice and many other products in Japan, is an important supplementary enterprise on most Japanese farms. Most of the rope and string used in Japan is made of this material, as are the rugs and mats used in place of chairs in all the homes and as walls of many houses (see figure 14). Another important byproduct of the rice industry in Japan is rice oil, obtained from the bran. The extraction of oil from rice bran by the solvent process was introduced into Japan in 1935. By 1944, there were 100 oil-extraction mills in Japan, more than one-half of which were reported to be in operation in 1948. This oil is used as cooking oil and in the manufacture of margarine and soaps.

The system of grading rice in Japan is directed by the Ministry of Agriculture and Forestry through an inspection bureau charged with planning the inspection of rice, the establishment of grade standards, and the guidance and supervision of inspections carried on by the local food offices. At the beginning of each harvesting season, a rice-grading conference is held, at which time samples of the current crop are examined and grade standards set for rice for that year. Standards vary from year to year, depending on the effect of weather conditions upon the quality of the crop. In establishing the grades, the moisture content, the weight per unit of volume, and the amount of impurities are the most important factors considered, with variations by regions taken into account. No commercial grades are established for rough rice, since the crop is hulled in the rural areas in which it is produced and sold by the farmer as hulled or brown rice. Four different commercial grades of hulled rice are established: No. 1, No. 2, No. 3, and Undergrade. The moisture tolerance for these grades varies by regions; the No. 1 grade has a moisture requirement of less than 14 percent in some areas and less than 16 percent in others. Polished rice is divided into only two grades - standard and undergrade - depending on the milling, color, and amount of impurities.

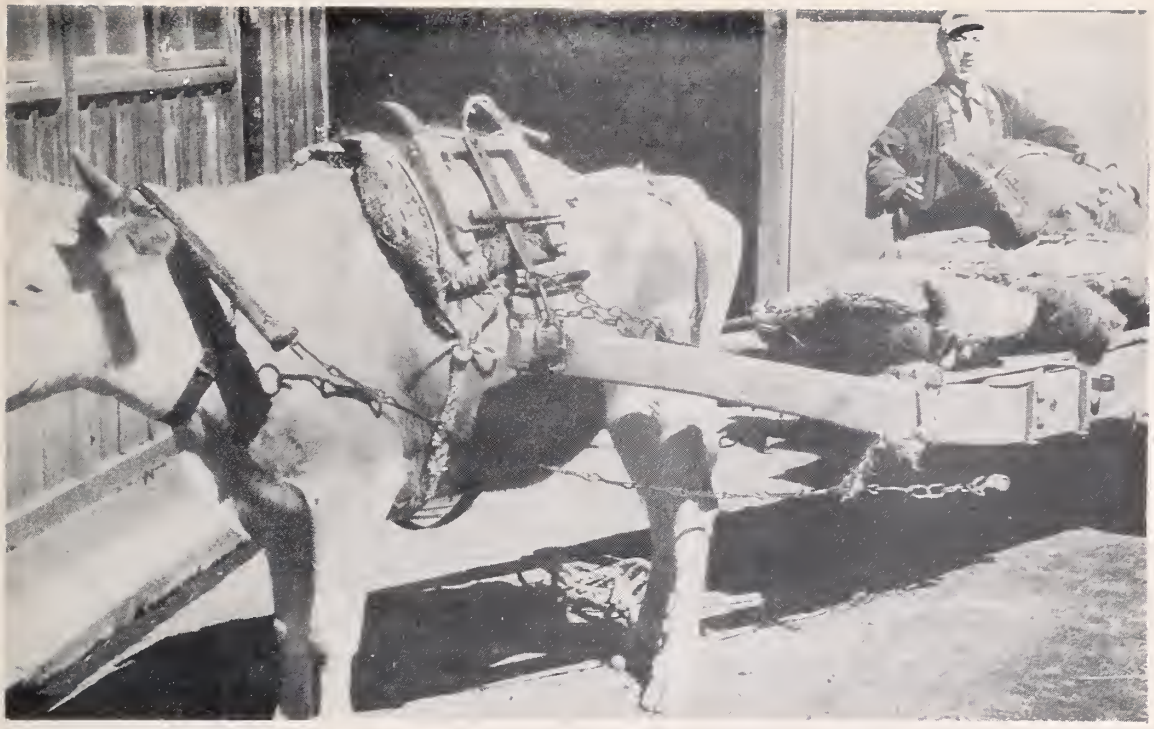

FIGURE 13.- Transporting rice from the farm to the village warehouse in Japan. Rice is usually threshed and hulled on the farms in Japan and stored in the village warehouse if it is to be marketed. The rice-straw sacks were made in the farm household.

FIGURE 14.- Byproducts of the rice crop in Japan. Rice straw is used in making such items as rope, sacks, baskets and other containers, mats, and rugs. Made mostly in the farm homes, the manufacture of rice-straw products is one of the most important rural industries in Japan.

FIGURE 15.- An open-air market in a small village in the Republic of the Philippines. The products displayed, including coconuts, sugarcane, squash, melons, green leafy vegetables, beans, turnips, potatoes, and onions, are indicative of the Republic's capacity to produce a variety of foods other than rice.

FIGURE 16.- Buying the weekly supply of rice in a Philippine market. The purchaser buys in bulk, choosing from the different qualities or types of rice displayed in open containers. About 70 percent of the Philippine population depend primarily on rice for food.

Japan offers possibilities of becoming a major market for United States rice. Its prewar sources of supply, Korea and Taiwan, are not likely to be able to provide Japan with rice in the near future, and the food deficit of the country must be filled from other sources. Since other surplus areas in Asia have relatively small export supplies and are likely to ship those supplies to nearby countries, Japan is likely to depend heavily on the United States for needed imports of food. This food could be United States rice if: (1) Rice prices delivered in Japan are somewhat comparable on a caloric basis with the prices of other food items, (2) the rice supplied to Japan is of the short-grain type, which they prefer, and (3) United States producers supply the rice in the form that is preferred in Japan, as brown or hulled rice. Since one of the major marketing problems of the United States rice industry is the disposal of the short-grain rice produced and since there is little demand within the United States and Latin America for it, the possibilities of Japan as a major market for United States short-grain rice should be fully explored.

India and Pakistan

Rice production in the Dominions of India and Pakistan for the 1947-48 season amounted to about 2 billion bushels on a rough-rice basis. This volume included 1.4 billion bushels in the Dominion of India and 570 million bushels in the Dominion of Pakistan and was harvested from 80.8 million acres. Of this total, 59.6 million acres were in India and 21.2 million acres in Pakistan. The combined production of the two Dominions for the 1948-49 season has been tentatively estimated at 2.1 billion bushels from an area of 82.5 million acres. In prewar, nonpartitioned India, including the area now comprising both the Dominions, total rice production for the 1935-36 to 1939-40 period averaged 1.95 billion bushels, produced on 72.8 million acres. India and Pakistan together continue to lead the world in rice acreage. Due to low average yields, however, they are second to China in total production. The average yield in India and Pakistan amounts to about 27 bushels, or 7 barrels, of rough rice per acre. As compared with the prewar period, the area in rice has increased by about 10 percent while the total production increased less than 2 percent.

Although the area comprising India and Pakistan is second only to China in total rice production, it has been a large importer of rice for many years. During the 1936-40 prewar period, prepartitioned India imported an average of about 1.86 million short tons of rice annually, of which about 90 percent came from Burma. In this same period, the region exported more than 300,000 short tons, leaving an annual net import requirement of about 1.6 million short tons. During the first 6 months of 1948, India, exclusive of Pakistan, imported about 670,000 short tons of rice, and estimated total imports for the year amounted to about 1 million tons. Since very little rice was imported into Pakistan in 1948, the total imports for the region as a whole for the year are indicated to be only slightly more than one-half of the prewar level.

In August 1947, prewar India was partitioned into the Dominions of India and Pakistan. Pakistan contains two major areas of prepartitioned India - the largest rice-producing area of the country in the Province of Bengal, which is located directly north of Calcutta on the east coast near Burma, and West Pakistan, which comprises the northwest part of former India and is a major cotton and small-grain area. The area that is now Pakistan was practically self-sufficient in food production in the prewar period and maintained about the same level in 1948, although the usual local shortages did exist. The partitioning of the region into two countries has intensified the deficit-food problem in the area that is now the Indian Union, because even less rice and other foods from the surplus areas is moved to the deficit ones. From most indications, Pakistan is likely to maintain a status of self-sufficiency in food production and may even export relatively small quantities, while the Dominion of India is likely to remain a deficit area that will require large imports of food, principally rice, for many years to come.

The most recent census of population in the region, which was taken in 1941, gave a total population of 389 million people, of which 317.4 million were in what is now the Dominion of India and 71.4 million were in the area now included in the Dominion of Pakistan. A comparison of the changes in population between the 1931 and 1941 census periods indicates an annual increase of about 5 million a year, of which about 3.8 million could be allocated to India and 1.2 million to Pakistan. Using this as a base, the 1948 population of the new India was about 345 million and that of Pakistan, about 80 million. This denotes a total population for the region of about 425 million people in 1948, a net increase of 35 million since 1941. However, published data on food production and food imports show that total food supplies in the region have not increased at this rate.

Observations of food conditions within the country and statements of many agricultural officials there, however, show that the picture presented by the official statistics is not as serious as the published facts indicate. Many of the technical workers and production specialists in India were emphatic in their belief that the crop reports in recent years have underestimated total production. They reported that total production of rice and other food crops had been increasing as much or more than the reported acreage increase and that they have observed no downward trend in per-acre yields. They stated that average yields of food crops, especially rice, are at least stable as compared with prewar and, if moving in either direction, are increasing gradually due to improved varieties, cultural methods, and fertilizer use. They pointed out that, with the population increase and with the current imports that are much less than prewar levels, very severe famines would have occurred, and would now be in progress in India, if food production within the country had not increased substantially. Famine conditions in India in the 1945-48 period have not been reported to be more serious than usual.

Although the relative seriousness of the food deficit in India may be subject to argument, an important food deficit does exist and is likely to continue to exist. The Government of India is now attempting to solve the food problem in many different ways. These include: (1)

Establishing "grow more food" programs, (2) supplying fertilizers to producers of food crops in limited amounts at subsidized prices, (3) establishing many small irrigation systems and initial plans for building several very large systems for irrigating thousands of acres, (4) reclaiming abandoned weed-infested land with the use of tractors for deep plowing, (5) expanding breeding and selection work to obtain high-yielding and better adapted varieties, and (6) making loans to food producers at low interest rates. All of these factors, however, will have little immediate effect on the production of rice and other food crops, but they will aid in gradually increasing production. Also, the immediate effects of some of the plans are likely to be less than desired, because of the hesitancy of native producers in India to adopt new practices and because of world shortages of equipment and such items as fertilizer.

With these various plans, the present Indian Government proposes to expand food-grain production by 10 percent during the next 5 years. If accomplished, at the end of the period this would amount to an average rate of production of more than 4 million tons of food grains (including about 3 million tons of rice) above the present annual production rate. Such an increase would completely wipe out India's deficit in food, assuming there is no great increase in demand. Although progress is being made, it is doubtful that this 10-percent increase will be reached in less than 10 years, and, by that time, India at its present rate would have a net increase in population approximating 40 million people. It would appear, therefore, that the import deficit of food will continue at about the present level. This means that India will continue to be an important factor in world rice trade but probably will import no more rice than in prewar years. Future imports of rice into India may actually be less than those of prewar years if prices continue at present levels, if foreign-exchange difficulties become more serious, or if India should have several good crop seasons.

Of the 7,000 known varieties of rice, more than 4,000 are grown in India and Pakistan. These varieties vary widely in color, translucency, polish, fragrance or aroma, size and shape of grain, cooking quality, adaptability to different climatic and soil conditions, resistance to salt water, total water requirements, and in many other ways. In addition to the usual white types, there are rices that are black when milled, others that are red, and still others that are blue or spotted. Some of the varieties have a distinctive odor or aroma, even after being milled and cooked. Some are only one-fourth the size in both length and thickness of our short-grain types; and others are longer and more slender than any of our long-grain varieties. As in other regions of Asia, each local community has a preferred type that is grown to the exclusion of all others, regardless of the relative yield or milling quality, because it "tastes better." In India, as well as in most of the other rice regions of Asia, this local preference for specific varieties is the major factor preventing production increases by the use of improved higher yielding varieties.

Although the many different varieties offer an interesting subject for study, they interfere with the orderly marketing of rice. In general,

domestic producers prefer the long-grain, hard, translucent types, especially if these have certain aromas that are highly desired. Some areas, however, want red rice; others like the black type best; and in some regions the short-grain chalky types are preferred. Of the total production of rice in India and Pakistan, about 13 percent is the long-grain type, including the aromatic varieties; 32 percent is medium-grain; and 55 percent is the short-grain type. In general, average yields per acre are from 15 to 60 percent higher for the short-grain types than for the more desirable medium- and long-grain rices. Because of this difference in yield, the production of short-grain rice is likely to continue to predominate in India.

In the field, some of the varieties are the usual light-green leaf color, while others are red, and still others are purple. Plant breeders have utilized these different leaf colors to good advantage as a means of keeping seed stock pure in areas that are badly infested with wild rice. To keep the seed pure, they have developed types with identical production and milling characteristics but with different colored leaf foliage. They then follow the practice of planting a green-leaf variety one year and weeding out all the red-leaf plants. The next year, they plant the red-leaf variety and weed out all the green-leaf plants. They also have purple-leaf varieties, which are used as border markers between plots and between farms.

About 60 percent of India's rice production is retained in villages and local areas for home consumption, and 40 percent is marketed through commercial channels. The average per-capita consumption of rice for the region as a whole was about 180 pounds per year in the prewar period but the rate varied from 28 pounds in the Punjab to more than 340 pounds in Bengal. At the present time, consumption rates are indicated to be at about the same level.

Because of the almost innumerable varieties of rice and the different methods of preparation, as well as the absence of any uniform grades or standards, the great bulk of the internal rice trade for both rough and milled rice is conducted on the basis of samples, the value being assessed only by visual examination. Rough and/or hand-milled rice is usually sold by the producer to a buyer or middleman in the village, frequently in a barter transaction, and the buyer, in turn, accumulates a larger volume for sale to a traveling buyer or other agent. As a rule, the rice goes through several hands before reaching the consumer.

About 57 percent of the rice produced in India is consumed as parboiled, milled rice and 43 percent as raw milled rice. There are two types of parboiling in India, domestic and commercial. Three-fourths of the rice kept for home consumption is parboiled in the households of the producers and consumers in local villages. Most of the population prefers parboiled to raw rice because it keeps for a longer period after being cooked. Thus, a fairly large quantity can be cooked at one time and used for several meals. This factor is very important in parts of India where fuel for cooking is scarce. The most common fuel is dried cow manure. It is collected when moist, pasted on the outside walls of

the homes or other buildings, and used sparingly after it dries. This type of fuel may account for the consumer's preference for a highly scented rice.

Commercial parboiling is relatively new. It was first established on a large scale in Burma about 1920, but, in India, domestic parboiling is almost as old as are the ordinary methods of preparing rice. A common method of parboiling rice in the homes is to boil the rough rice in open containers until the grains begin to swell, spread the rice in the sun or on a floor to dry, then mill it by hand. In some areas, the rough rice is boiled for a few minutes, soaked in cold water for 24 to 36 hours, and again boiled for a few minutes, before being dried and milled. In addition to the better keeping qualities after being cooked, higher milling yields are obtained and lower grain breakage results. Another unintentional advantage of the process in that a food product with a higher nutritive value is obtained than that of raw highly polished rice. This may explain how the natives of India live on a strict rice diet and experience fewer difficulties from vitamin deficiencies than natives who live in other areas where raw milled rice is consumed.

In addition to parboiling, another important practice has helped to maintain nutritional minimums in a straight rice diet. About 70 percent of all the rice produced in India is hand-pounded or hand-milled, and only 30 percent is machine milled, high-polished rice. The hand-milling on the farm or in the home is done with the use of the hand mortar and pestle (a hollow log and a wooden club) or similar devices operated by the feet. Hand-milled rice is not highly polished, contains most of the outer layers of the grain, and yields about 72 percent edible rice, 3 percent bran, and 25 percent hulls and waste. Machine-milling of rough rice in India usually yields 68 percent edible rice, including 10 percent brokens, 8 percent bran, and 24 percent hulls and waste.

Because of the great number of varieties and the lack of uniformity of the product, as well as variations in local supply and demand factors, it is almost impossible to establish an average price for rice for the country as a whole. Local prices vary according to the season, variety, aroma, age, and other factors, such as whether the rice is machine- or hand-milled or raw or parboiled. Old (stored) rice, or milled rice produced from rough rice that has been stored for a year or longer, sells for a higher price than the fresh product from the current crop. For 1 year's storage, a premium varying from 5 to 20 percent is obtained. The reason given for this preference for old-crop rice is the same as that given in Japan for the preference for fresh, milled rice from the new crop. They say it "tastes better."

Wholesale prices for milled rice in the different provinces of India and Pakistan in July 1948 varied from 3 to 15 cents per pound, averaging about 9 cents. In Calcutta, the largest rice market in India, the retail price for milled short-grain rice was equivalent to about 6.6 cents per pound for rice sold under ration allotments and about 7.3 cents per pound for rice sold on the open market. Although all food grains were rationed in most provinces of India and Pakistan in 1947, the current

program is one of gradual decontrol, and food rationing in July 1948 was being carried on only in the larger cities, with plans being made to abandon all rationing by the end of 1948.

For rice sold retail at the equivalent of 7 cents per pound, the producer received about 2½ cents per pound for the rough rice or 3½ cents per pound for the home-milled, hand-pounded, finished product. The farm price amounted to the equivalent of about $1.25 per bushel, or $4.50 per barrel, of rough rice. Producer-to-consumer price spreads in India and in most other parts of Asia appear much larger than price spreads for similar items in the United States.

In India and Pakistan, as a whole, rice is grown throughout the year with seasonal crops overlapping, making it difficult to establish a definite crop year. Three different crops are produced: (1) The winter crop, sown from May to August and harvested from November to January, (2) the autumn crop, sown in April and May and harvested in September, and (3) the summer crop, sown in January and February and harvested from March to June. The winter crop accounts for 80 percent of the total production of the region, the autumn crop for about 18 percent, and the summer crop for 2 percent. Most of the country depends on natural rainfall for rice irrigation, and the production season is timed according to the coming of the monsoon. In India, in contrast to southeast Asia, the monsoon weather varies from year to year in time and in the amount of rainfall, making rice production more hazardous and causing localized famines from time to time.

About 20 percent of the rice plantings in India and Pakistan are broadcast, and 80 percent are transplanted. Broadcasting results in lower yields than transplanting, but this method necessitates less water for growing plants and for preparing land, and it is used in many regions where irrigation water is a limiting factor. Because of the dry season, no second crops are grown on most of the land in these areas.

The land is prepared for rice in India by plowing with bullock teams of the Brahman type. Although India has a large water-buffalo population, these animals are maintained for milk production rather than for work stock. The average labor requirements for growing and harvesting rice amount to 15 man-days and 60 woman-days per acre, or a total of 75 days. The men do the plowing and fitting, and pull up the plants and haul in the crop after harvesting. The women do the setting, weeding, harvesting, and winnowing of the grain after threshing.

Traditionally, in India as well as in most other parts of Asia, only women to the heavy work of transplanting, weeding, and harvesting the rice by hand. According to legend, if men transplant the crop, the plants will fail to tiller and grow; if men weed the crop, the birds will destroy it; and if men harvest the crop, it will decay immediately after harvest.

Because of water shortages early in the season when the rice plants must be produced, most of the rice nurseries in India are not irrigated. Under the common practice for growing seedbed plants, the seedbed is first covered with a layer of dry grass, leaves, tree limbs, dried cow dung, and all other available inflammable materials; a fire is then set to the mass, and it slowly smolders and burns until converted to ashes.

Then the area is lightly plowed, and the seed is sown. This ancient practice has its advantages in producing good plants under the existing conditions. It is cheap, since there are no purchased materials; it serves to disinfect the seedbed; and it makes the soil loose and porous, so that the available moisture will be retained and the plants can be pulled up easily without breaking. The rice farmer plants about 1 acre of nursery plants for each 10 acres of rice. About 40 to 60 pounds of seed per acre of transplanted rice are used by this method as compared with from 125 to 150 pounds of seed per acre by the direct broadcasting method. Because this seedbed preparation practice is very destructive to forest resources, the agricultural workers in India have discouraged the practice in order to conserve timber and prevent erosion; but they have had little success.

Insofar as United States rice producers and millers are concerned, Indian rice is not likely to compete directly with United States rice in world markets. The Indian Union will continue to be a deficit area; and Pakistan, although self-sufficient, will not produce enough rice to export any large volume. On the other hand, although the Indian Union is a deficit area, there is little possibility of marketing United States rice in India. We do not produce the high-quality types that they like since our long-grain rice has no aroma, and we cannot compete with the low price of their short- and medium-grain rices.

Indirectly, however, trends in the production of rice in India will have an important bearing on United States rice markets in foreign areas. If India does not expand rice production in proportion to the rate of her population increase and if she has the foreign exchange with which to purchase rice from Burma and Siam, there will be less rice for export from these two countries to other world markets - especially in Europe and Latin America. On the other hand, if, as the result of successful internal expansion of production or for other reasons, India reduces rice imports significantly, the United States can expect increasing competition in Latin American and European rice markets from Burma and Siam; and the possibility of developing rice markets in the Republic of the Philippines and in Japan will be eliminated. Based on present indications, India is not likely to buy any more rice from Burma and Siam than was imported prewar and might take considerably less. Thus, intense competition in Latin American and European markets between Burmese and Siamese rice and United States rice may come sooner than is generally expected. It could come within 2 to 5 years, depending upon weather conditions and stability within the surplus-producing countries and upon the demand in India.

Republic of the Philippines

The total rice production from 5 million acres in the Republic of the Philippines for the 1947-48 marketing season amounted to about 110 million bushels, and the harvest in 1948-49 is expected to be 118 million bushels. In the prewar years (1935-36 to 1939-40), an average of about 105 million bushels was produced on 4.85 million acres annually.

The Philippines have regained their prewar status in rice production and are gradually expanding. A long-time expansion program, developed by the Government beginning in 1946, indicates that it plans to increase the rice acreage to about 5.6 million acres by 1956 and expects annual production to average about 140 million bushels within 10 years. Assuming reasonably stable conditions, these goals appear within reach, and they are likely to be attained.

Along with this expansion in the production of rice, the Government plans to increase the production of such other food crops as corn, beans, and vegetables so as to reduce the annual import requirement for clean rice from about 310,000 short tons to only 78,000 short tons by 1956 (figure 15). In spite of current food production apparently equal to prewar levels and a reasonable expectation of another 10 percent increase in total food levels, there appears to be a food shortage in the Philippines, which is likely to continue for some time. Most specialists estimate that the country produces about 85 percent of its food at the present time, and although the production of most food crops is expanding, the population is also increasing at a rate of 2.2 percent per year. Food production in the next 10 years cannot be expected to expand at a faster rate. The net result is that the country will continue to have a net deficit in food.

The total food deficit is likely to be between 200,000 and 300,000 short tons annually for the next few years. Since about 70 percent of the population depends primarily upon rice for food, the indications are that there will be a market in the Philippines for rice produced elsewhere for some time to come (figure 16).

Consumer demand for rice in the Philippines is for the long-grain hard types. Rexora and Patna types, and the other long grains to a lesser extent, are acceptable to the Philippine trade, although they prefer domestic rice to any imported rice. The lower quality, medium-grain and all short-grain rice from the United States or other areas is not liked and it can not compete with the other types. Also, there is no demand for parboiled rice. In the Philippines any local rice that is sticky, or that does not separate freely after cooking, is considered spoiled and unfit for human consumption. Therefore, any imported rice with this characteristic is also suspected of being spoiled. Such ideas, based on generations of experience, are not likely to be changed. The Filipinos do like, and will buy, long-grain rices, such as those produced in the United States, in Siam, and in French Indochina, but they will not buy medium- and short-grain rice if anything else is available.

Because the social standing of the family in the Philippines is judged by the relative whiteness of the rice that is served, the Filipinos want white, completely milled, highly polished rice; but they will not buy undermilled rice or parboiled rice if anything else is available. The characteristic yellow color of most parboiled rice plus its relative stickiness or glutinous nature are factors in such disfavor in the Philippines that there appears to be no chance of marketing this type of rice in the Islands. Also because of its color, there are not likely to be any

large-scale markets for undermilled rice in this region. However, consumers do not object to a high percentage of broken grains so long as the rice is highly polished.

Rice marketed in the Philippines is graded into four general groups or classes. Although there are no rigid specifications in general use and purchases and sales are made mostly by a visual examination of the lot, the top grade appears to be a long-grain rice, highly milled, with about 10 percent brokens. The second grade is long-grain rice, highly milled, but with some foreign matter and with a broken-grain tolerance up to 25 percent. The third grade is long- to medium-grain rice, highly milled, but made up of 30 to 50 percent broken grains. The fourth and lowest grade is undermilled or discolored rice, in some cases "hand-pounded," with a relatively high percentage of broken grains and foreign matter. This grade usually does not appear in the rice markets, since it is consumed on the farms where it is produced. Most of the rice moving through commercial channels in the Philippines is of the second or third grade. The trade reports that although Filipinos prefer the first or top grade only about 10 percent of them can afford to pay for this high-priced rice. Most of the effective demand is for the lower priced second and third grades.

About 80 percent of the rice area in the Philippines is lowland, planted to irrigated rice, which is transplanted. The other 20 percent is planted to upland rice, which is broadcast on dry land. Here, no formal irrigation is practiced. The lowland rice land is plowed at the beginning of the rainy season, then flooded and worked in the water. The rice is transplanted in May and June (see figures 2, 4, 7 and 8). The seedlings from seedbeds that are sown a month to 6 weeks earlier are pulled when 8 to 10 inches high, pruned to 6 to 8 inches, and set by hand in clumps of three to five plants with about 8 inches between hills. The crop is irrigated from the natural accumulation of water during the rainy season (which amounts to about 80 inches for the June to November period) as well as from surface streams that have high water levels during the rainy season, permitting irrigation by the natural gravity process rather than by pumping. The fields are weeded by hand during the growing season and drained at the beginning of the harvest period, which begins in December and extends through January. The crop is usually cut by hand; bundled and allowed to dry in the field; and hauled to the farmstead, where it is threshed either by hand or with small stationary threshing machines. The rice consumed by the farm family is mostly "hand-pounded," but that which goes into commercial channels is sold as rough rice and milled in nearby towns and cities.

Under these production methods, average labor requirements vary from about 300 man-hours per acre for lowland rice to 250 for upland rice. The average acreage of rice produced by one family is about 6 acres.

In March 1948, wholesale prices for rice in the Philippines were equivalent to about $12.00 per hundred pounds for the first grade, $10.00 for the second grade, $9.00 for the third grade, and $8.00 per hundred pounds for the lowest grade. United States long-grain rice of Rexora type, of fair quality with about 10 percent brokens, was selling for

$12.00 per hundred, while other lots of parboiled rice and undermilled, poor-quality, short- and medium-grain rice from the United States had been reduced in price by the Government rice-marketing agency to less than $8.00 per hundred and still were not moving.

There appears to be a reasonable chance to market some United States rice in the Philippines during the next 10 years. The country has a food deficit, and rice is preferred to all other foods and will be imported in fairly large quantities if it is available.

In contrast to most other countries in Asia, some foreign exchange (dollars) with which to pay for imports is available from war-damage and rehabilitation payments from the United States as well as from such exports as sugar. However, this exchange position will be affected as the war damage and rehabilitation payments decline; and the future United States market for rice in the Philippines will depend more and more upon the Republic's ability to earn dollar exchange through exports and upon other factors, including those discussed in the three paragraphs that follow.

First, the United States rice industry must attempt to sell to the Philippines the quality and type of rice desired by the Philippine consumer rather than the surplus poor-quality rice that will not move within the United States. In 1946 and 1947, most of the United States rice imported into the Philippines was low-quality, undermilled, medium- and short-grain rice. The people consumed it because there was no other rice available, but they, for the most part, are now prejudiced against United States rice. It will take many years of careful marketing to offset this brief experience with United States rice. The Philippine people like and will buy long-grain rices, such as Rexora and Nira, but short-grain rice will not sell if anything else is available.

Second, the United States industry must mill rice to be marketed in the Philippines in the way that the consumers want it, rather than in the way that will result in the highest possible milling yield. They want and will buy very white, completely milled, highly polished rice, but they do not want and are not likely to buy undermilled or parboiled rice.

Third, the United States industry must meet the price competition of other countries that will be bidding for the Philippine rice trade. Siam is likely to be the principal competitor since this country also produces long-grain rice. Because of the fact that, although the Philippine consumer wants highly milled, long-grain rice, he does not object to a very high percentage of broken grains, it might be possible to market some of the lower quality (but not undermilled) long-grain rice produced in the United States at a competitive price, since large volumes of this type of rice are difficult to move in the United States.

Malayan Union

Rice production in the Malayan Union for the 1947-48 marketing season totaled 27 million bushels as compared with 20 million bushels in 1946-47 and a prewar average (1935-36 to 1939-40) of about 27 million bushels annually. Rice acreage in the Malayan Union has increased more

rapidly than total production. The acreage harvested in 1947-48 was 862,000 compared with 797,000 acres in 1946-47 and only 746,000 acres for the 5-year average from 1935-36 to 1939-40.

This rice acreage of above prewar levels and a total production equal to peak production prior to the war has been obtained under an active Government program to stimulate rice production. This program includes a compulsory Food Scheme under which 2 percent of the tillable land of all estates of 100 acres or more must be planted to food crops, thus forcing the large rubber estates to plant more rice; Government-guaranteed prices to producers and the movement of incentive goods into rural areas so that farmers may buy needed items with the income received; and controlled milling to utilize all available rice supplies.

Beginning in January 1947, and maintaining the program throughout 1948, the Government of the Malayan Union made a flat price guarantee, to all producers of rice, equivalent to about $3.15 per bushel, or $11.35 per barrel, of rough rice. The mills were all placed under Government control and paid a flat contract fee equivalent to 2 cents per pound of rough rice to mill rice for the Government. This rice was not polished. It was hulled and sold as "brown" or unpolished rice in order to increase the milling yield and maintain higher nutritional standards. This rice is being sold to consumers under a Government rationing program, providing 6½ ounces per capita per day at a price equivalent to about 11 cents per pound. Long-time average per-capita consumption in the Malayan Union has averaged about 12 ounces daily. The higher income groups in 1948 were purchasing additional rice on the black market at a price equivalent to 30 cents per pound.

In addition, the Government is developing plans for expanding the rice area by building new irrigation systems, renting Government land and providing water to farmers at very low rates, establishing some mechanized methods of production, and granting other special privileges to rice growers. The major objective seems to be to assure a more adequate supply of rice, so that there will not be another shortage such as that experienced during and immediately after the war.

Since about 1910, when the rubber-growing and tin-mining industries were developed in Malaya, only about a third of the total rice consumed in the Malayan Union and Singapore has been produced in the country, and two-thirds has been imported. Of that produced within the Malayan Union, about 50 percent is hand-pounded and consumed on the farms where produced, 20 percent is paid out by the producers as wages or barter and is hand-pounded and consumed in the local areas, and about 30 percent reaches commercial channels. Although rice production in the Malayan Union is expanding, the area (including Singapore) is likely to continue to be a large importer of rice and can be expected to import between 450,000 and 650,000 short tons annually during the next few years if supplies are available. The actual amount will fluctuate according to business activity in rubber and tin and the success of the Government program in expanding internal production.

There are no import duties on rice in the Malayan Union or Singapore, and most of the imports come from Burma and Siam. The native

Malayan population prefers the type and taste of locally produced rice, which is of the medium- and short-grain types. The Chinese population, however, which makes up 45 percent of the combined population of 6 million, prefers the long-grain, hard types, such as Siamese rice. There are no standard grades, and all purchases are made on the basis of visual examination of each lot.

About 90 percent of the rice produced in the Malayan Union is of the "wet paddy" type, or transplanted irrigated rice. The remainder is dryland broadcast rice on which the yields are relatively low. It is produced mainly by the more primitive population in the sparsely populated hilly areas. The average producer grows from 2 to 3 acres of rice from which the family harvests about 150 bushels of rough rice. This is the equivalent of about 3,000 pounds of hand-pounded rice. Since the per-capita consumption on farms is about 300 pounds annually and there are an average of 6 persons per farm family, this means that more than one-half of the total production is consumed on the farm. The remainder is paid out for labor, is bartered, or is sold. Average labor requirements for this type of production amount to 45 days per acre as compared with less than 3 days in the United States. Fortunately for the men, the women traditionally do all the work in transplanting and harvesting the crop. Their basic excuse for this is that traditionally, it is believed that "only the fertile can produce a fertile crop."

For the most part, the plant nurseries are seeded in August and transplanted from September through December (see figure 5, 7, and 8). The men pull the plants from the seedbed and haul them to the fields, and the women set them out. These women either set by hand or with the use of a simple tool called a Kulu Kambing, or goats hoof, which saves much of the stooping. The average transplanting time is 12 days of woman-labor per acre, setting three plants per hill with hills spaced about a foot apart. As the crop grows, some weeding is practiced to stimulate growth and prevent shading.

Two-thirds of the crop in Malaya is cut by the women using the "pisau menuai," which is a peculiar knife set in a wooden base to fit the palm of one hand. Each head or stalk is cut separately, the straw left standing, and the heads are bound together in bunches and sun-dried before being threshed. One woman averages about 4 bushels of rough rice per day by this method. After drying, these bundles are threshed by placing them on a clean hard surface or floor and stamping on them with the feet or beating them with sticks. It is then winnowed by lifting it and letting it fall, with the usual strong wind blowing away the chaff and straw. Average threshing requirements are 5 bushels of rough rice per woman-day.

The other third of the crop is harvested by Indian coolies, who are paid 15 percent of the crop for cutting and threshing and who cut by grasping several stalks at one time and cutting them with a sickle. These bunches are then dried in the field and threshed by beating them against the side of a tublike container. The threshed grain is winnowed in a deep bamboo basket, which is suspended between two poles and rocked gently from side to side to let the wind blow away the chaff.

The hand-pounding or on-farm milling operation is accomplished with a simple piece of equipment - usually a hollow log or stump into which fits a heavy piece of wood attached to the end of a bamboo pole. This is turned by hand with a rotary motion to grind away the hulls from the rice grains. Average accomplishments for this milling operation amount to about 2 bushels of rough rice per woman-hour. Some of the more mechanized farm homes are equipped with a more efficient machine that has two grinding surfaces with the top one revolving by use of foot or hand power. Milling yields for these hand-pounding operations seldom average more than 50 percent, and the proportion of broken grains is from 50 to 65 percent.

Commercial milling is done with mills of the Engleburg type, the Under-runner type, and various hand-operated or water mills. In 1915, the process of parboiling before milling was introduced into Malaya, and it is still being followed to some extent to supply parboiled rice to the Indian laborers who like the distinct flavor of parboiled rice. The rough rice is usually heated for 10 minutes at 20 pounds of steam pressure. This process improves milling yields and reduces the proportion of broken grains. The Malayan and Chinese populations in the Malayan Union and Singapore, however, have always refused to eat parboiled rice, and there is little demand for the product. Milling yields under usual commercial operations in Malaya and Singapore are reported to average from 54 to 66 percent whole rice, 6 to 12 percent brokens, 8 to 12 percent bran, and 20 to 22 percent hulls.

Rough rice for farm use is stored on the farms in wooden or bamboo bins in the farmhouse. That purchased by the mills is stored in adjacent warehouses, both in bulk and in sacks. As in other countries of this region, losses due to rats are severe in most of the warehouses. So far, the rice millers report that they have found no method of rat control that is as efficient or as effective as their "old fashioned method," which has been in use for hundreds of years. This consists of catching pythons in the nearby jungle and placing these snakes under the floors of the rice "godowns," after fixing the buildings so that the snakes cannot escape. They report that 2 to 4 pythons per godown will keep all the rats out. They warned, however, that in large godowns, where 6 to 12 pythons must be used, one must be sure to use all males or all females. If this is not done, an overproduction of snakes in relation to the supply of rats will cause the pythons to turn to the next available animal, the mill worker or even the miller himself. It appears that one of the essential qualifications of a good mill operator is to be able to tell the sex of a python.

Although the Malayan Union and Singapore are large importers of rice, in view of their geographical location between Burma and Siam and of the fact that the United Kingdom is likely to conserve their dollar-purchasing power for more "essential" items, it is doubtful that any rice from the United States can be sold in this region during the next few years. If their domestic production continues to expand at the present pace, however, the reduction in the Union's imports from nearby exporting areas could cause a larger supply of Asiatic rice to become available

in markets where the United States competes. Because of the initial success in expansion of production, developments in this region should be watched closely by the United States rice industry.

The Netherlands Indies

Rice production in Java and Madura for the 1947-48 marketing season amounted to 275 million bushels, which was harvested from 9 million acres. Prospects for the 1948-49 season were indicated to be about 5 percent better than in 1947, or an expected crop of about 290 million bushels. Prewar production (1935-36 to 1939-40), however, averaged more than 313 million bushels from 9.8 million acres, thus Java and Madura have not regained prewar production levels for rice and are not likely to do so before 1949 or 1950. Outside of Java and Madura, there are few facts available concerning rice production and trade in the Netherlands Indies. Production in all the other islands is estimated at about 98 million bushels annually and has changed little over a period of years. Practically all of this rice is consumed locally.

Immediately prior to World War II, the Netherlands Indies became a net exporter of rice on a small scale. Total production was expanded to meet all domestic needs, plus a small volume for export, by the construction of additional irrigation facilities by the Dutch, the development of improved varieties with higher yields, and more intensive cultivation, including the growing of two crops a year on some of the land. There appears to be little prospect, however, that the Netherlands Indies will again become a net exporter of rice within the next 10 years.

Dutch officials hope that the area may reach a stage of self-sufficiency by late 1948 or 1949 and have an export surplus by 1950, but it seems doubtful that this goal can be accomplished. The population of the islands decreased by about 5 million during the war but is again increasing at a rapid rate. There are about 45 million people on the Island of Java alone and a total of about 70 million in all of the Netherlands Indies. Because of this increased population, larger domestic supplies of rice than were needed in prewar years are likely to be required. Also the current unrest in the Netherlands Indies, with a native government in control of part of the islands and the Dutch governing the remainder, is likely to retard any expansion program and the orderly marketing of the crop if it is produced in larger quantities.

Milled rice is graded into four different classes in Java. The first quality is "bealoe," which is long-grain bearded rice and is the luxury rice of the area, low in yield, but in special demand by the more wealthy consumers. The second quality is "hoing," which is slightly smaller in grain size than the first quality but compares with much of the long-grain rice in Siam and is similar to Fortuna and Nira rice of the United States. The third quality is "tjeree," which is short-grain rice. The fourth quality is "ketan," or glutinous rice, which is consumed in relatively small quantities in special dishes for festive occasions. About three-fourths of the rice consumed in Java is of the

third quality, either hand-pounded or undermilled and containing about 40 percent broken grains.

In Java, rice is sold by the liter, a volumetric measurement. Thus, the dealer, who buys by weight, is interested in buying a light weight rice to make an additional profit on the sale by volume. For light-weight rice in Java, it takes 129 liters to make 100 kilograms; for heavy rice, only 123 liters.

Rice supplies and prices in Java are controlled by the Dutch Government through the Food Supply Board, established in 1940. This Board has established sales centrals throughout the area to aid in collecting supplies and controlling prices. These centrals were maintained by the Japanese during the war but are now being operated by the central Dutch Government. Practically all the rice mills in the islands are owned and controlled by Chinese business interests. In brief, the natives grow the rice, the Chinese mill it, and the Dutch market the product. At official exchange rates, retail rice was sold by the Dutch authorities at about 9 cents per pound during the early part of 1948. Rice rationing has been maintained in Java since the end of the war. The daily ration available in March 1948 at officially controlled prices was from 120 to 200 grams daily for low-income groups, 80 to 120 grams for medium-income groups, up to 100 grams for high-income groups, and special extra rations of from 150 to 400 grams daily for heavy workers. Long-time, per capita consumption rates in Java average about 190 pounds annually with the rate being about 350 pounds on Sumatra and Borneo.

The official guaranteed price to farmers for rice produced in 1948 was about 15 guilders per quintal for Java paddy. Converted to rough rice and using official exchange rates, this amounts to about $1.90 per bushel, or $6.80 per barrel. The mills are required to purchase the rice at this fixed price and are paid by the Government about $9.00 per hundred pounds for the milled rice. Grading is done by the use of standardized sealed samples furnished to each mill by the Rice Control Board. Black-market prices for rice were somewhat higher than fixed official prices throughout 1946 and 1947 but appeared to be leveling off in 1948. According to many Dutch officials, there was an adequate supply of rice in the Netherlands Indies to supply all needs if the farmers could be persuaded to sell it. Because of inflation and the lack of consumer goods, however, the farmer was apt to keep his rice and eat five or six meals a day, if necessary, to consume all of his production, rather than sell it when he had no confidence in the money and there was nothing to buy. Consumer goods, and especially textiles, appear to be needed as incentives if all the surplus production is to be obtained from the rural areas.

Of the 20 million acres of land on Java and Madura, which are available for native agriculture, only about 10 million acres are suitable for rice, and most of this area is planted every year. About 85 percent of the rice area is planted as lowland irrigated rice and 15 percent as upland unirrigated rice. Of the irrigated areas, about 20 percent is under highly developed, gravity-flow, irrigation systems developed by Dutch engineers during the past 30 years; another 20 percent is supplied

by simpler gravity-flow irrigation systems from local streams; and the remaining 60 percent is irrigated by the collection of natural rainfall within the levees or bunds. Further expansion of rice production in Java appears to be limited as there is no more land suitable for irrigation. More than one-half of the land now used for rice is rolling to hilly and can be adapted to rice only by building many small levees and elaborate irrigation systems to supply water.

While the topography is not too favorable, climatic conditions are almost ideal for rice production. The climate is such that rice can be planted or harvested in any month of the year, limited only by the amount of water available for irrigating the crop. The area is subject to both the west monsoon and the east monsoon rains, and some moisture is available every month. Thus, farmers grow two rice crops a year on some of the land, where there is sufficient water, and harvest rice in every month of the year. Long-time statistical data on rice production by months indicate that about 2 percent of the total production is harvested in January, 2 percent in February, 6 percent in March, 13 percent in April, 27 percent in May, 23 percent in June, 9 percent in July, 5 percent in August, 4 percent in September, 4 percent in October, 3 percent in November, and 2 percent in December.

Before the war, there were 530 rice mills in Java. Due to destruction during and after the war, however, Dutch officials estimate that there were only 200 in operation in 1948. Since about 80 percent of the total crop is kept on the farms for local use and is hand pounded (hand-stamped) with a bamboo pole in a hollow log or stump and since only 20 percent moves to the mills for processing and sale, the loss of more than one-half of the mills has not been a handicap in processing the available rice for domestic consumption, but it will be a serious drawback if supplies become more plentiful and exports of rice are made. The mills in operation were, for the most part, inefficient, and low-quality rice was produced because of inadequate machinery and the difficulty of making repairs.

In contrast to most other rice areas in the world, the rice mills in Java thresh the rice as well as mill it. Rice is harvested in Java by cutting each individual stalk about 15 inches below the head, tying the stalks up in bundles of from 15 to 30 pounds, and then stacking or storing these bundles for threshing by hand, when needed for home consumption, or for sale to the miller in the bundle, unthreshed. Thus, each mill has threshing facilities and large warehouses to store the bundled grain before threshing. These bundles of rice are called "paddy" in Java but are not comparable to the paddy rice of the remainder of Asia or to rough rice in the United States, since the paddy of Java is unthreshed rice heads plus from 12 to 15 inches of straw. The millers in Java report a 50-percent outturn of milled rice from this Java paddy, as purchased, or a yield of 64 percent in milled rice from the rough rice after it has been threshed.

If and when the Netherlands Indies becomes an exporter of rice, it is not likely to compete seriously with United States long-grain types, although it could cause the loss of some of our short-grain markets.

The Dutch rice breeders on Java are probably further advanced in developing disease- and insect-resistant varieties and types adapted to different soil conditions than breeders are in any other country in the world; but they have placed major emphasis on obtaining high yields rather than quality. Also, even though a minor volume of high-quality rice is produced on Java, the condition of most of the mills is such that it could not be milled properly. The Dutch in the Netherlands Indies do desperately want and need more foreign trade, and they hope to expand rice production in order to develop rice markets in Europe. In view of the political uncertainties and the quality of the rice now being produced in the Indies, this appears to be a long-time aim rather than a practical reality. There are 8 million rice-growing families on Java with an average of about 1 acre of rice per farm, thus most of the rice will be kept for home use. The population, which was increasing at the rate of 700,000 annually just before the war, now can be expected to resume this rate of increase; and internal food requirements will be larger than even before.

Hong Kong

Hong Kong is a British Crown Colony of about 300 square miles, which is located on a series of islands at the mouth of the Pearl River in South China. It is primarily a port and trading center and, at present, has a population of about 1.8 million people. It has only about 20,000 acres of land that are planted to rice. This area produces only enough rice to supply the population for about 10 days out of each year, and Hong Kong must therefore depend upon imports for most of its rice supply. The population is 90 percent Chinese, and rice is the major food of the people.

Prewar, Hong Kong imported about 715,000 to 1,100,000 short tons of rice annually, consuming from 160,000 to 175,000 short tons and exporting the remainder to Canton, Shanghai, Tientsin, and other cities in China. This rice trade was based on imports of high-quality, long-grain rice from Siam and lower-quality rice from Burma and French Indochina. These different types of rice were then mixed or blended in Hong Kong to provide a lower-priced average grade, which still had some of the characteristics of the long-grain, hard-type rice so highly prized by the Chinese. This blended form was then sold in the relatively low-income regions in China. Due to rice shortages during and after the war, this rice trade has been discontinued, and the Hong Kong Government now has a law prohibiting the export of rice from the Colony..

The normal prewar per capita consumption of rice in Hong Kong was from 13 to 14 ounces per day, or about 300 pounds per year. According to the best available estimates, about 200,000 short tons of rice were imported in 1947 and a similar amount was expected in 1948. Of these imports, part came from allocations by the International Emergency Food Council's rice committee and part came in ex-allocation from French Indochina, Siam, and Kwangtung Province in South China. These supplies, plus the domestic production, indicated that Hong Kong was consuming

about as much rice per capita as was consumed before the war. This was possible because Hong Kong, a booming trade center and possibly the most prosperous business center in Asia, had very few currency or exchange regulations or import duties, and average earnings appeared to be high enough so that the people could pay the relatively high prices asked for that part of their rice supplies purchased on the black market.

Government-controlled rations and prices applied to that part of the rice supplies that came in through regular IEFC allocations. The official rice ration in April 1948 was 7½ ounces per day. In addition, authorities were selling the equivalent of 3 ounces per person, per day, through other channels in order to move some of the surplus stocks accumulated because of heavier-than-anticipated shipments from Siam and in order to stabilize the price of unrationed or black-market rice.

The rationed rice was being sold at a price equivalent to about 10 cents per pound. The black-market price for unrationed rice, which averaged about 20 cents per pound throughout 1947, declined in the spring of 1948 to about 15 cents. In April 1948, the administrators of the rice-rationing program in Hong Kong were having difficulty in getting the people to purchase low-quality lots of rice in the ration program, such as the Siam C-1 and C-3 grades (small broken rice). According to these administrators, such grades make up an average of 20 percent of all shipments from Siam.

Early in 1948, a small quantity of United States long-grain rice appeared on the Hong Kong market. This rice was apparently originally scheduled for other areas since there have been no IEFC allocations of rice from the United States to Hong Kong. According to trade reports, however, it was either stolen from the ships as they passed through Hong Kong or distributed to Chinese in the interior of China who then resold it to Hong Kong dealers. This rice was in great demand by the Chinese population in Hong Kong because of its long-grain hardness and very white color. It was called glass rice by the trade, and the demand for this glass rice was such that the black-market price soon increased to 35 cents per pound. Based on this experience, if a few more ships went astray or if a few more thousand tons of good quality, long-grain United States rice were distributed in the nearby interior of South China, it might be possible to build up a demand in Hong Kong for high-quality, long-grain rice from the United States. As in the remainder of Asia, however, only a very small part of the population will ever be able to pay the relatively high price for this type of rice.

The rice produced in the colony of Hong Kong is a slender, long-grain relatively high-quality type. As in most other areas in Asia, the native prefers the locally produced rice to the extent that he will pay from 25 to 50 percent more for this than for any of the imported rice. Research workers reported that much higher yields could be obtained from varieties other than the native one, which has been in use for hundreds of years, but that producers refuse to grow other varieties because of the difference in taste. Based on this observation in the Hong Kong producing area and similar observations in many other rural areas throughout Asia, one of the most difficult problems in the improvement of rice

supplies by the introduction of higher-yielding varieties will be to overcome the local resistance to change due to long-established real or imagined taste preferences.

The climate in the Hong Kong region and the neighboring area of South China is such that two rice crops a year are grown on all land where there is sufficient water for irrigation. In Hong Kong, two crops of rice are grown annually on 90 percent of the rice land. The first crop is seeded in March, transplanted in April, and harvested in July. The second crop is seeded in June, transplanted in July, and harvested in November. During the dry season, from November to April, the land is planted to sweetpotatoes. Thus, these producers obtain three food crops a year - two rice crops plus a sweetpotato crop - from the available cropland. Also, with the dense population and the intense demand for food, all of the available cropland is used, including hillsides with as much as 45-degree slopes, which are terraced into very small plots that in many cases are no more than 100 square feet to the field. All of the work is done by hand, including planting, transplanting, weeding, harvesting, and threshing. With the small hillside fields, even the water buffalo and wooden plow cannot be used to advantage, and more than one-half of the land area of the Hong Kong region was reported as being plowed or worked with hand tools prior to planting (figure 3).

With such intensive land use, the problem of maintaining soil fertility is an important one. Producers in this and the nearby South China area attempt to solve this problem in several ways. Some imported peanut cake is used as fertilizer and, where available, is reported to increase rice and sweetpotato yields as much as 50 percent. More important, are the other organic fertilizers of a local nature, which are used by all farmers. In addition to the widespread use of "night soil" (human feces), which is purchased at so much a bucket in the towns and cities and taken out to the farms, they cut all available grass, weeds, and brush from the hillsides and plow it into the rice lands just before planting. Over the years, this practice has caused the hillsides and mountains to be completely denuded of brush, weeds, and even grass. On these hillsides, there are numerous small piles of powdered soil called worm-casts, which are the remains of the action of many worms on the hillsides. These soil residues are also carefully collected by the farmers and deposited on the fields. This material is reported to be high in phosporous and potassium, and the collections, plus the remainder that is washed down the hillsides during the rainy season, are reported by the research workers to be sufficient to maintain the necessary phosphorous and potassium content in the cropland so that nitrogen is the major element needed. The action of the worms is carefully protected by the farmers who prohibit city invaders from digging up the worms for food, except in areas where they have observed that the worms have stopped making worm-casts. In such cases, they dig them up and eat them. The moral is that even a worm has to work for a living in rural Hong Kong and South China.

There appears to be little chance of marketing any substantial

quantity of United States rice in Hong Kong. Next to the local produce, the population prefers Siamese long-grain rice, then French Indochinese long-grain, and last of all, the Burmese short-grain rice. Although they prefer the long grains, the fact that Siam and French Indochina are so close in comparison to the United States long-grain area, plus the shortage of dollars with which to buy any products from the United States, will preclude the development of markets for our rice in this area. A demand for a very small amount of a fancy, high-quality, long-grain rice could be created. But, due to the relatively low incomes of most of the population, it is doubtful that rice in sufficient volume could be sold at a high enough price to justify shipment almost halfway around the world.

THE SURPLUS-RICE REGIONS OF THE NEAR EAST AND EUROPE

The only two important surplus-rice countries of the Near East and Europe are Egypt and Italy. Rice exports from Italy in the 1936-40 prewar period accounted for 99 percent of total exports originating from all European countries. Exports from Egypt for the same period amounted to 85 percent of all rice exports originating in Africa. Historically, most of the rice exports from these two countries moved to deficit-rice countries in Europe.

The rice acreage for this region, as a whole, averaged 825,000 acres annually for the 1935-36 to 1939-40 period but increased to 1,153,000 acres in 1947-48 and 1,165,000 in 1948-49. Total production increased from 71.8 million bushels in the prewar period to 96.8 in 1947-48 and 97 million in 1948-49. During this period, a decline in the rice acreage in Italy of about 5 percent was more than offset by an increase in the acreage in Egypt amounting to more than 75 percent.

Total exports of these two countries averaged 306,620 short tons annually during the 1936-40 period but increased to 386,500 short tons in 1948. Recent trends in the acreage, total production, and rice exports for these two countries are presented in table 7. Although the prewar exports moved primarily to Europe, most of the exports in 1948 went to deficit countries in Asia.

According to present indications in Egypt and Italy, this region is likely to continue to produce a larger volume of rice than was produced before the war. And it is likely to produce an average of 500,000 short tons of available export supplies during the next 5 years in comparison to the 300,000-ton annual rate of exports in the prewar period. Egypt may not continue the present high level of rice production, but any decline in production in this country will likely be more than offset by an expansion of production and available export supplies in Italy.

Practically all of the rice produced in this region is of the short-grain semiglutinous type. Due to the necessity of growing a short-season rice crop in Egypt, so as to utilize the land for a winter crop each year, and to the short growing season for rice in Italy because of climatic conditions, short-grain production in this area should continue to predominate. The short-grain rice produced in this region, however,

is a high-quality product and, when properly cleaned and graded, compares favorably with similar rice produced and milled in the United States. Both countries have efficient milling machinery and are capable of producing high-quality milled rice if and when competition makes it necessary.

Since the region has expanded its rice production during the war years and is likely to maintain production and exports at a relatively high level in the next few years, the area will offer more competition to both United States and Asiatic rice in European markets in the future than in the prewar period. In the prewar period, Europe imported about 1.5 million short tons of rice annually but about half of these imports were of cheap grades and broken rice, which were used for livestock feeding. Thus, if Europe does not import more rice in the future than in the past, the effective demand in Europe for rice for human consumption will not be much larger than the available export supplies of nearby countries in the Near East and Europe. This could mean even smaller markets in Europe for United States rice than existed before the war. Since the Asiatic area now has a net deficit in rice supplies and is not

TABLE 7.- *Rice acreage, production, and exports, Egypt and Italy, averages 1935-36 to 1939-40, annual, 1946-47 to 1948-49*[1]

COUNTRY	1935-36 to 1939-40	1946-47	1947-48	1948-49[2]
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*
ACREAGE:				
Egypt.....	463	656	805	815
Italy.....	362	325	348	350
Total	825	1,081	1,153	1,165
	1,000 bushels	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*
PRODUCTION:				
Egypt.....	33,155	45,971	62,533	65,000
Italy.....	38,620	26,000	34,300	32,000
Total	71,775	71,971	96,833	97,000
	1936-40[3]	1946[3]	1947[3]	1948[4]
	Short tons	*Short tons*	*Short tons*	*Short tons*
EXPORTS:				
Egypt.....	139,500	224,000	183,500	336,500
Italy.....	167,120	165	-	50,000
Total	306,620	224,165	183,500	386,500

[1] Crop year beginning August 1.
[2] Preliminary.
[3] Calendar year.
[4] Crop year, 1947-48

Office of Foreign Agricultural Relations. Compiled from official and other sources.

likely to become a net exporter in less than 3 to 5 years, trends in rice production in Egypt and Italy will be more important in relation to United States-European rice trade than developments in Asia.

Since the Near East-Europe surplus-rice area produces only short-grain rice, a market for the long-grain United States product should still exist in Europe, even if the short-grain market is lost to the nearby areas. Also, although this region had the land and water to produce large quantities of rice in the prewar period, production was expanded only when the world shortage of rice caused world prices to move up to unprecedented levels. There is some question as to what would happen if rice prices were to decline substantially. Rice production in this region, especially in Egypt, has been encouraged and stimulated by many Government measures, primarily because the Government earned a large profit by controlling prices and selling the export supply at much higher prices than were paid for the product. If prices go down and this windfall profit is not available, the attitude of the governments in both Egypt and Italy may suddenly change.

Egypt

Rice production in Egypt for the 1947 crop year amounted to 62.5 million bushels and was produced on 805,000 acres. This, until 1948, was an all-time peak in both rice production and acreage for the country, which historically has been the only major rice-exporting country in Africa. Production in 1948 exceeded the 1947 crop and 65 million bushels were produced from an area of 815,000 acres. In the 1936-40 prewar period, rice production in Egypt averaged 33.2 million bushels annually from a planted acreage of 463,000 acres. Since the beginning of the war, the production of rice in Egypt has about doubled due to both acreage expansion and increased crop yields.

About 335,000 short tons of milled rice were exported from Egypt in the 1947-48 marketing year. This was almost three times as great as the average exports during the 1936-40 period. Exports for the 1948-49 marketing season are expected to exceed those of the preceding season. Although total production in 1948 was larger than in 1947, consumption within the country is expected to be less, leaving export supplies at about the same level. In 1947, some of the rice produced was used in bread-grain flour mixtures because of the shortage of wheat, but, with more abundant wheat supplies, this practice can be expected to decline.

About two-thirds of Egypt's prewar rice exports moved to various countries in Europe, and the remainder was sold to neighboring countries in the Middle East. In 1947 and 1948, however, less than 10 percent of the total exports moved to Europe, while the remainder went to central Asia and the Far East. Ceylon, which in prewar years obtained most of its rice supplies from Burma, was the largest customer in 1948, followed closely by Korea and India. This unusual movement of Egyptian rice was the result of the relative shortage of rice from the largest normal supplier in central Asia - Burma. As Burma and Siam gradually regain prewar levels of export, Egyptian rice can be expected to move again to

its normal geographic markets in Europe. If the production of rice in Egypt is maintained at 1947 and 1948 levels after Burma, Siam, and French Indochina regain prewar export levels, then the internal rice production of Europe plus Egyptian export supplies will furnish the Continent with a volume of rice almost equal to its total consumption, exclusive of rice used for feed, in the prewar period. This could mean that in these circumstances, there might be practically no market in Europe for rice produced in Asia, Latin America, and the United States. For this reason, the American producer and miller should closely watch trends in the Egyptian rice industry.

The rice region of Egypt is in the central Nile Valley and, since there is practically no natural rainfall, the crop is irrigated. Since total land area subject to irrigation is limited, rice competes directly with many other crops, including cotton, sugarcane, corn, oilseed crops, and vegetables. The rice area in Egypt has more than doubled in the past 10 years because of favorable world rice prices relative to prices for competing crops.

If the price of rice in relation to prices for these other crops becomes less favorable, the acreage can be expected to decline accordingly. Also, rice requires more water than most other crops and the major part of this water requirement in Egypt comes in the spring and summer months, from April to June, which is the critical water period for the other important crops. Thus, the area of rice that can be grown in Egypt in any given year is limited by the spring and early summer flow of the Nile. When water supplies are plentiful, as was the case in 1947, a large area of rice can be grown. When water supplies are low, the acreage must be reduced. According to reports from producers and research workers in Egypt, a minimum of about 300,000 acres of rice will continue to be grown, regardless of price changes and relative water supplies. This will be done because the rice crop makes up an essential part of one of the most common rotations, which includes 2 years of cotton and 1 year of rice, and because of the practice of planting rice first on reclaimed lands so as to eliminate undesirable elements in the soil. Any area above this minimum will depend upon available supplies of water and upon the price of rice as compared with the price of competing crops, especially cotton. In 1947 and 1948, both factors were favorable to rice. Most observers in Egypt think that this situation cannot continue to exist. They do think, however, that Egypt will continue to produce a larger volume of rice than was produced in the prewar period.

The Ministry of Public Works of the Egyptian Government determines the maximum rice acreage that can be planted each year. Since water is the limiting factor, they issue a series of orders called rice permissions that fix the maximum proportion of the tillable land that can be irrigated in rice. The first of these orders is usually issued in April and is based on winter forecasts of the spring and early summer flow of the Nile. This order is usually conservative and is followed up with supplementary "permissions," issued in May and June as the final water supply situation becomes more definite. In the years after high winter floods, there has been an abundant supply of water, permitting large rice "permissions."

The rice produced in Egypt is of the short-grain Japanese type, and the usual growing season is 135 to 145 days. There is a small acreage of an early variety, grown in Fayoum Province, that matures in 110 days. Three major varieties account for about half of the total area planted, and about 50 minor varieties are planted on the remaining acreage. Of the 1948 crop, about 30 percent was transplanted, and 70 percent was broadcast. The trend is toward transplanting. Five years ago, less than 10 percent of the total area planted was transplanted rice. This change in practice is the result of the higher yields obtained in transplanted fields and of the fact that, by transplanting, the land is left in winter crops for a longer period of time. All of the land is double-cropped, and the demand for land use to produce the second crop is one of the major reasons that most of the rice produced in Egypt is of the short-grain, early maturing type.

The rice lands of Egypt are plowed with oxen, heavily fertilized with both manure and chemical fertilizers, and then flooded just before transplanting or broadcasting. The transplanting and broadcasting are done by hand. Due to the relative scarcity of water, irrigation of the crop throughout the growing season is carefully controlled. Much less water is used than is common in the United States. The fields are drained several times during the season, keeping just enough water to cover the soil during the first part of the season and adding heavier applications at the heading stage. The rice lands of the Nile Valley are flat and treeless and are arranged in large rectangular fields with only enough terraces for water control. These fields appear to be similar to the rice regions of the southern States, except that in Egypt there is no fallow land. The crop is weeded by hand several times during the growing season, the field is drained before harvesting, and the rice is cut by hand. After drying several days in the field, the shocks are transported to a central location and threshed by spreading them evenly on the ground and running a crude machine, pulled by oxen, over the cut grain a number of times (figure 17). After this operation, the grain and straw are swept into a pile and winnowed by casting the chopped-up straw and grain into the air with wooden pitchforks and permitting the usual strong wind to blow away the straw and chaff (figures 18 and 19). Since the area has no rainfall, the crop is frequently stored by just piling it up in the field or the farmyard until it is moved to the mill.

The average rice yield per acre in Egypt is 20 barrels, or 70 bushels. This yield is about the same as in the highest yielding areas in Asia, and it is 20 bushels per acre higher than for the United States and only 10 to 20 percent lower than in the highest yielding countries in the world - Italy and Spain. These yields are maintained by rotations, including the plowing under of some organic matter, the application of 20 to 40 tons of manure per acre, and a standard application of about 250 pounds per acre of ammonium sulphate. Ammonium sulphate is the preferred fertilizer for use on rice in Egypt. At the present time, it is in short supply, and cottonseed cake is being used as a substitute at the ratio of 4 to 1. Egypt is expanding her fertilizer-manufacturing

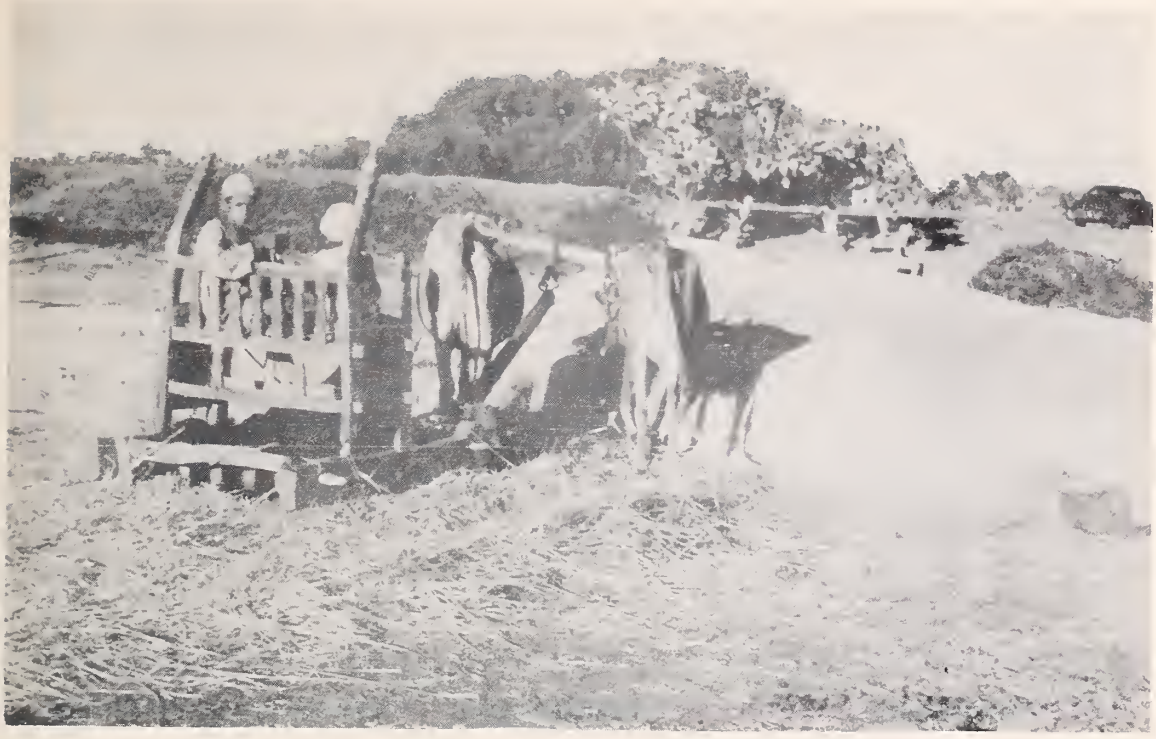

FIGURE 17.- Threshing grain in Egypt. Both rice and wheat are threshed by an ox-drawn sled driven over and over the mass on a level spot in the field.

FIGURE 18.- Collecting threshed grain in Egypt. After the rice or wheat is threshed, the grain and finely cut straw is raked into piles prior to cleaning.

FIGURE 19.- Cleaning grain in Egypt. Using a rake, the worker lifts the grain and chaff into the air to allow the wind to carry away the chaff. This winnowing does not remove the heavy particles of soil.

FIGURE 20.- Weeding rice in Italy. The weeding is done by crews of itinerant workers, mostly women, who migrate to the rice area in the spring and remain for the 2-month weeding season.

facilities with the building of a plant, which is expected to produce 275,000 short tons of calcium nitrate annually when it reaches full production. This plant is scheduled to begin operating in 1950. Another plant, under construction but not expected to be completed for 5 years, is designed to produce an annual supply of 440,000 short tons of nitro-chalk.

Not only the production but also the marketing of rice is rigidly controlled by the Government of Egypt. Each year, the Government issues regulations requiring the sale of a certain portion of the rice crop to designated Government agencies at fixed prices. This regulation applies to all producers of more than 1 acre of rice, and the amount to be delivered varies from 15 bushels per acre for small farms up to 33 bushels per acre for individual farms with more than 100 acres in rice. Under this plan, the Government collected about a third of the total rice produced in 1947, for which they paid a fixed price of $1.52 per bushel of rough rice.

This Government-owned rice is delivered to private millers who are paid about $3.00 per short ton of rough rice for milling the product. These mills are required to deliver 69 pounds of milled rice per 100 pounds of rough rice delivered to them on this contract basis. Average milling yields are as follows: Polished rice including 6 to 12 percent brokens, 70 percent; rice germ, 1 percent; bran, 9 percent; and hulls and waste, 20 percent. As an indication of the relative profitableness of the rice-milling operations under the present Government-controlled program, new mills are being built, the older ones are being expanded, and additional storage facilities for rough rice are being constructed.

The remainder of the crop, the non-Government rice, is purchased by the millers from farmers at prices similar to or slightly higher than those paid for the Government-request part of the crop. After the rice is milled, however, it is subject to maximum prices. Therefore the Government has, in effect, established fixed milling margins by controlling both the purchase price for rough rice and the wholesale price of the milled product. The wholesale price for milled rice in 1948 was equivalent to $5.62 cents per hundred pounds. The retail price in Egypt approximated 6 cents per pound.

Millers and private dealers in Egypt are not permitted to export rice. The Government is the sole exporter and uses its accumulated supplies for export sales. It also purchases milled rice from private millers to fulfill additional commitments. In 1948, the millers were paid the fixed ceiling price of $5.62 cents per pound, and the total cost to the Government for the Government-request rice was about the same. The fixed export price charged by Egypt in 1948, however, was equivalent to $8.45 per 100 pounds. The profit in this transaction amounted to about 40 percent of the export price of the product.

In 1948, about 70 percent of the rice milled in Egypt was of the "Mamsouh" grade, which is undermilled, contains some red grains, has from 12 to 21 percent brokens, and contains foreign matter up to about 3 percent consisting mostly of small black particles of soil. Considering all factors, the Mamsouh grade is about as good as Burma "small mills

specials" or Siam "35 percent brokens." An additional 20 percent of the rice is milled as cargo or brown rice, to meet certain export demands and for use in mixed flour for the local population. The remaining 5 percent is of the higher-grade, 8 percent brokens and special quality glazed rice.

Some of the countries receiving rice from Egypt have made complaints as to the quality of this rice. An investigation of this problem reveals that, although all of the rice produced is of the short-grain type, it is a uniform product and originally of good quality. However, because of the method of threshing (using disc-type rollers to cut the rice from the straw on the ground and then winnowing the chopped-up product by hand), much foreign matter, mostly small lumps of black soil, is left in the original rough rice. Before the advent of good cleaning and milling machinery, much of this foreign matter became a part of the finished product, thus an official 3-percent tolerance as to foreign matter was made a part of the grading regulations. Due to the present shortage of rice, the practice of some millers in Egypt is to clean out all of the foreign matter before milling, to mill the rice in modern efficient machinery that produces a good-quality product, and then to mix back into the milled product as much foreign matter as the official 3-percent tolerance will permit. As long as rice is in short supply, the incentive for this practice will exist. But because there is no basic deficiency in the original quality of the rice produced or in milling methods, the practice will disappear when active world-wide competition is resumed in the rice trade. Egypt can produce high-quality, short-grain rice equal to that produced anywhere else in the world, and competing exporting countries should not be misled by the quality delivered to some countries in recent years. When competition becomes intense, Egypt can and will leave her Nile Valley soil at home rather than ship it to Ceylon and Korea at 9 cents a pound.

Egypt is likely to remain on the "doubtful" side in regard to world trade in rice for some years to come. Because of the limited amount of land and water and the many crops that compete with rice, total production is not expected to expand much beyond 1947 and 1948 levels. This level, however, was much higher than prewar and, if maintained, with prewar supplies from the normal prewar exporting countries of Asia, it could mean a surplus of rice in the Near East-Western European region. This would mean the loss of prewar rice markets in this region for both the United States and Asia. Because they can and do shift rapidly from one crop to another, depending on relative prices, it is doubtful that the current level of rice production in Egypt will be maintained if and when world rice prices decline materially. Even so, Egypt is likely to be a much more important factor in the rice trade of the next 10 years than at any time before the war. For United States producers, this means that it will be difficult to sell short-grain rice in Europe in competition with Egypt at world price levels because of lower transportation costs from Egypt to nearby countries. However, United States long-grain rice is preferred to Egyptian short-grain rice in the quality markets of Europe.

Italy

The production of rice in Italy for the 1947-48 season amounted to about 34 million bushels from a planted area of 348,000 acres. Production for the 1948-49 season from about 350,000 acres is expected to be 31 million bushels. Due to adverse weather conditions in the spring and summer of 1948, the average yield per acre of the 1948-49 crop was expected to be less than for the preceding year. The average annual production for the 1935-36 to 1939-40 prewar period for Italy was 37.6 million bushels from a planted area of 362,000 acres.

Total rice exports from Italy for the 1947-48 season are estimated at about 50,000 short tons of milled rice. This compares with only 15,000 tons in 1946-47 and an annual average of 168,000 tons for the 1935-36 to 1939-40 period. With increased availability of wheat due to good crops throughout most of the world in 1948, total exports of rice from Italy for the 1948-49 season should be close to 75,000 short tons in spite of the fact that a lower total crop was expected in 1948 than in 1947. In Italy, during the war and immediate postwar years, rice was substituted for bread grains, resulting in relatively high consumption within the country and lower exports. With an adequate supply of bread grains, this practice can be expected to diminish, and a larger proportion of the total production will be available for export.

The yield of rice in Italy in 1947 averaged 100 bushels, or 28 barrels, per acre. In the 5 years preceding the war, average yields amounted to 110 bushels, or 30 barrels, per acre. These yields are more than twice as great as average yields in the United States and are second only to yields in Spain where a much smaller acreage is grown. These unusually high production rates are a subject of interest throughout the rice world. Among the factors contributing to such yields in Italy are: (1) The application of barnyard manure at the rate of 10 to 30 tons per acre, just before planting rice; (2) heavy applications of chemical fertilizers to the rice crop, including a mixture of ammonium sulfate, superphosphate, and potassium chloride at an average rate of 700 pounds per acre, with two-thirds of this fertilizer being applied before seeding or transplanting and one-third as a top-dressing early in the growing season; (3) the long-time rotations followed in the Italian rice area, including several years of a leguminous hay crop preceding the planting of rice; and (4) the practice of transplanting part of the crop, which is reported to result in higher yields than the usual broadcasting or drilling methods. The intensive hand-weeding (figure 20) practiced and the natural fertility of the Po Valley soils are also important factors.

Practically all of the farms are combination rice-dairy-hog-poultry farms. The usual rotation is a 5-year one, including clover hay (mostly Ladino clover) for 3 years followed by rice in the summer and wheat in the winter for 2 years. In some cases, the rotation is a 7-year one, with 3 to 4 years in clover hay and 3 to 4 years in rice. The rice and wheat straw produced is used for feed and bedding for the livestock; the clover hay and pasture are used for maintaining dairy cattle for the

production of butter and cheese; and, on the larger farms where "on-farm" rice mills process the rice, the bran and brokens are used for dairy-cattle and hog feed. The byproducts of the cheese and butter industry furnish much of the hog feeds, and the waste grains on the farm are used for maintaining the poultry enterprise. The rice farms of the Po Valley of Italy (figure 21) are more diversified than are any of those of the United States, Asia, or Africa.

Although the production of rice in Italy is a diversified operation, there is no similar degree of diversity in the marketing of the product. The Italian rice industry is under the rigid control and direction of a Government organization that was established on a temporary basis in 1931 to solve a special surplus-rice problem, but that has been operating and gaining strength ever since. This organization, the Ente Nazionale Risi (National Rice Office), was set up to maintain prices to producers by holding the domestic market price at a high level by limiting domestic supplies and dumping surplus rice on the world markets at any price that could be obtained. This practice was followed from 1931 to 1942 and it is likely to be resumed once world rice supplies become more plentiful. In addition to maintaining prices to producers, the practice of controlling domestic supplies in order to maintain such prices has caused the per capita consumption of rice in Italy to decline materially. This means that, with a given volume of production, an increasing proportion of the total volume will have to find export markets.

All rice farm prices, milling margins, wholesale prices, retail prices, and exports are controlled by the Ente Nazionale Risi. Fixed prices for the 1947 crop were established on the basis of an expected world shortage of rice similar to that experienced in 1946. The pricing program included a bonus for production above domestic requirements. The farm price for the 1947 crop varied from the equivalent of $2.00 per bushel (or $7.20 per barrel) for the short-grain types up to about $2.35 per bushel (or $8.50 per barrel) for the long-grain types. These prices included the bonus payment for the export surplus, which amounted to about 22 cents per bushel, or 80 cents per barrel, of rough rice. The fixed wholesale price paid to millers for milled rice of the 1947-48 crop varied from $7.10 per hundred pounds for the "Commune" short-grain type up to about $10.10 per hundred pounds for the long-grain "superfino" type. Controlled retail prices for this rice varied from about 8½ cents per pound for the short-grain rice up to 14 cents per pound for the best-quality, long-grain types.

Export supplies were required to be sold to the National Rice Office at the official wholesale ceilings. At the beginning of the 1948 marketing year, this organization set an f.o.b. price for prospective customers at $350 per metric ton, or about 16 cents per pound, with the additional requirement that the importing country supply Italy with 2.5 units of wheat per unit of rice purchased. No rice was officially exported under these terms. A few months later, the asking price was reduced to $300 per metric ton, or 14 cents per pound. Still no rice was exported. In June 1948, the asking price for rice was reduced to $275 per metric ton, or 12½ cents per pound, and the wheat-exchange ratio

FIGURE 21.- An irrigation ditch and a rice field bordering a road in Lombardy, Italy. Rice fields in the Po Valley are irrigated by means of an elaborate system of dams, canals, and ditches, which impound and carry the spring flow from the Alps. The fields, varying mostly from 10 to 40 acres in size, are usually enclosed with Lombardy poplar windbreaks.

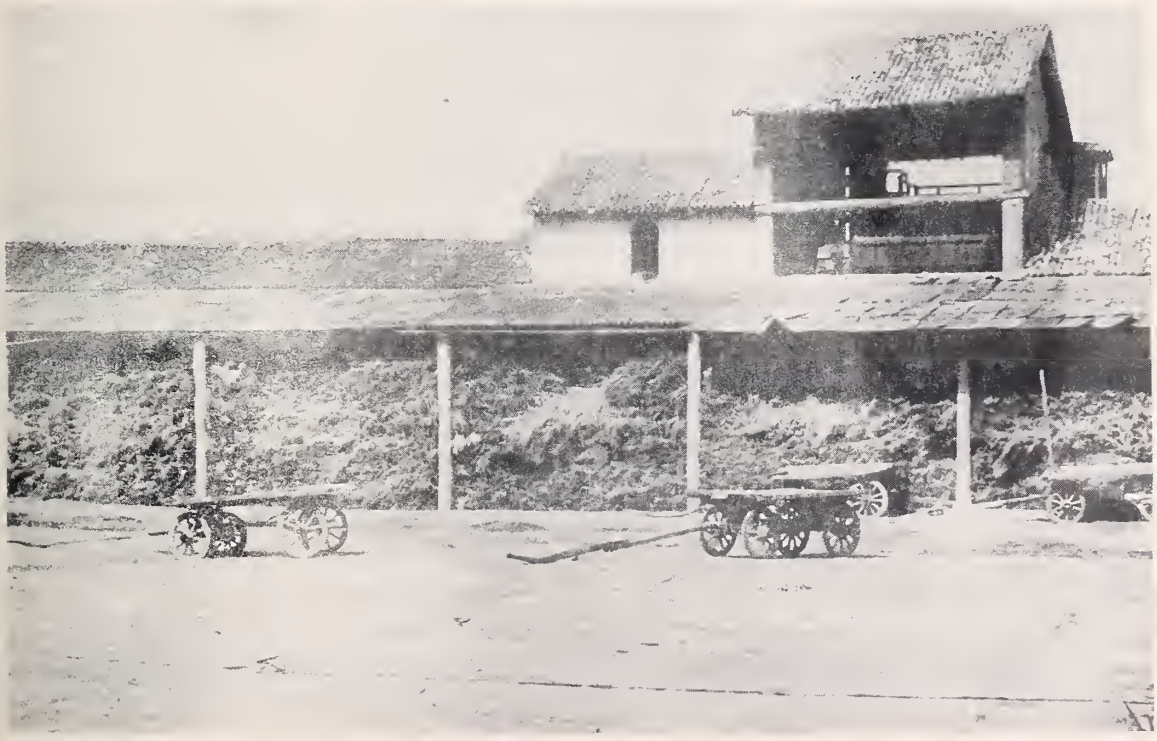

FIGURE 22.- Rice straw stored on a farm in the Po Valley. In Italy the rice straw is used for feed and bedding for dairy cattle in the fall and winter months.

FIGURE 23.- The "parboiling" rice mill of the Ente Nazionale Risi (National Rice Office) near Milan, Italy.

FIGURE 24.- Rough-rice warehouses of the Ente Nazionale Risi, near Milan, Italy. These warehouses contain bins for bulk storage as well as space for sack storage and have bulk transportation equipment to move the rough rice to the nearby mill. The warehouses are ratproof and are fumigated frequently for control of weevils.

reduced to 1.3 units of wheat per unit of rice. At this time, the current domestic wholesale price for rice was $175 per metric ton, or about 8 cents per pound, and unofficial reports indicated that some rice was unofficially moving to nearby countries, but not at the official export price set by the Government or with the required wheat exchange. By the end of the 1948 year, however, the wheat exchange requirements were reduced and most of the export surplus is reported to have been sold at prices ranging from $250 to $275 per metric ton of 2,204.6 pounds. The difficulties incurred in moving the 1948 export surplus were caused by the necessity of obtaining a relatively high export price in order to pay the promised bonus to farmers for producing the surplus. This bonus promise had been based on a prospective world price of rice under 1946 supply conditions; world supplies increased, world prices decreased; and the "forward price" proved to be too high to move the rice and pay the promised bonus.

Rice is produced in Italy by both hand-transplanting and direct broadcasting methods. The practice of transplanting is increasing, and, in 1948, transplanted rice made up about a third of the total acreage. Higher yields per acre are obtained; and, by transplanting, rice can follow wheat, or the hay land can be left untouched, for 2 months longer before plowing. As a result, an extra cutting of hay can be obtained. For broadcasting, the usual procedure is to plow, fit, and fertilize the land in March; flood and puddle it; and broadcast on water late in March and April. For the transplanted crop, the nursery beds are planted in March, the land for the field crop is plowed and fitted in early June, and the transplanting is done in June and July. Harvesting begins in late August and extends through late October. The crop is harvested by hand, shocked and dried in the field, and hauled in to the farmstead. It is then stored in large barns and threshed during the winter months in permanent threshing machines in the barn. The straw is baled and stored or stacked in the barnyard (figure 22).

Four major types of rice are produced in Italy: (1) "Commune," or short-grain rice; (2) "Semifino," or medium-grain; (3) "Fino," or rice similar to United States medium- to long-grain types, such as "Fortuna," and (4) "Superfino," which is similar to such long-grain types as "Rexoro." Of the total production in 1947, 73 percent was of the Commune type; 14 percent, Semifino; 11 percent, Fino; and 2 percent was of the Superfino type. Because of the short growing season and the relatively high yields obtained from the short-grain types, indications are that Italy will continue producing mostly this kind of rice. In the prewar period, 95 percent of Italy's rice exports were of the short-grain Commune type, which in 1948 made up practically all of its exports. In comparison with rice from Egypt and Burma, however, this short-grain rice is very highly milled, contains 7 percent or less of broken grains, is free of discolored grains and foreign matter, and is an attractive product.

Only one standard grade of milled rice for each of the four grain types has been produced since the end of the war. The milling yields for these vary from 64 percent head rice and 7 percent brokens for the

Commune type to 60 percent head rice and 8 percent brokens for the Semifino; 54 percent head rice and 12 percent brokens for the Fino; and 49 percent head rice and 17 percent brokens for the Superfino type. The average milling yields on all types are about 70 percent; bran yields are 8 percent; and hulls and waste, 22 percent.

According to the Ente Nazionale Risi, Italy now has 948 rice mills, about the same number as before the war. Of this total, 651 are privately owned mills, operated by business men; 75 are mills operating on a toll basis for nearby farmers; 221 are "on-farm" mills operated by private producers who are also millers; and 1 is a new mill built and operated by the Ente Nazionale Risi. Most of the private and the farm mills are fairly small but clean and efficiently operated. The equipment in several of the mills of this type, which were visited, included 2 hullers, 1 shaker or sorter, and 3 polishers on the lower floor; and 3 cleaners and sorters and the sacking mechanism upstairs. This machinery was all of the "Minghetti" type, manufactured in Vercelli, Italy, which is in the center of the Po Valley rice area. The reported capacity of mills of this type was about 1 short ton of rough rice per hour.

The one large mill (figure 23) operated by the Ente Nazionale Risi was constructed in 1940 and has been operated by this Government agency since that time. It has a complete modern parboiling unit, which is protected under Italian patents; and, according to the manager and the Ente Risi officials, it produces a quality of parboiled rice superior to that produced anywhere else in the world. The mill is large, clean, and appears efficient; and the parboiled product was a high-quality, almost white, short-grain rice with practically no brokens. This parboiled rice was of higher quality than the United States product that was shipped to China in 1948 and the parboiled rice now being produced in Burma, but it still had the characteristic smell of parboiled rice. The Italian officials hope to develop a large export demand for this product. The capacity of this mill was reported to be 75 short tons daily of rough rice, including parboiling. In contrast to parboiling units observed in Burma, this process involved an endless chain of buckets of rough rice that moved slowly through a long vat of heated water, then a steam bath, then more hot water, and finally into a series of upright dryers before the product was sent to the hullers. The mill operators reported that they obtained an average of 10 percent more head rice by this process than by ordinary milling. They reported a 5-year average of 70.8 percent head rice in comparison to test yields at other mills, using the same quality rough, of 60 percent head rice and 10 percent brokens. In connection with the mill, the agency had one large flat warehouse (figure 24) with a storage capacity of 20,000 short tons of rough rice, in sacks.

Developments in the Italian rice industry will have much bearing upon the markets for United States rice in Europe. Although most of the rice produced in Italy is of the short-grain type and will continue to be of this type, the mills produce a relatively high-quality uniform product. If there is much difference in the price of the Italian product, European buyers will be likely to purchase Italian rice because of lower

transportation costs. In the long-grain, high-quality field, they will offer little competition other than that caused by the general relationship of short-grain to long-grain prices.

Since rice controls were established in 1931, the Italian rice industry has been directed by the Ente Nazionale Risi; and it has been subsidized, more or less, by maintaining the artificially high prices within the country. Left to its own devices, if these controls were removed, the industry would be likely to find its own level in the world rice picture in the next few years. This level would probably be a production pattern about the same as in 1947 and 1948, but with lower prices to domestic consumers and a resulting larger amount being consumed within the country. With the continuation of present controls, however, consumer prices for rice in Italy are likely to remain high and the sale of excess Italian rice on world markets will be resumed when supplies increase.

THE DEFICIT-RICE COUNTRIES OF EUROPE

European countries provided important market outlets for rice from surplus areas in the prewar period. During the 1936-40 period, annual rice imports into the deficit-rice countries of Europe averaged about 1.65 million short tons of milled rice and rice products. About half of these imports were low grades and broken rice imported for use as livestock feed. Most of the remainder was short-grain rice, which was imported from Italy, Egypt, Burma, and French Indochina. Three-fourths of the rice imported into various deficit-rice countries of Europe in the prewar period was imported as brown or hulled rice and was milled within the various consuming countries. United States exports to Europe in the 1936-40 period averaged about 25,000 short tons annually, and all of this rice was sent to Europe as milled polished rice.

France was the most important prewar importer of rice, averaging more than 600,000 short tons annually during the 1936-40 period. About 80 percent of these imports were of low-quality rice from French Indochina, which was used for feed and industrial purposes. Germany, with annual imports averaging more than 200,000 short tons for the 5-year period, and the United Kingdom, with imports of about 150,000 tons annually, were the two other important consumers.

The consumption of rice in Europe declined drastically during the war years, due to lack of available supplies. Total imports in 1946 for these countries amounted to less than 25,000 short tons, and imports in 1947 were only 77,000 short tons. Expected imports for 1948 are about 100,000 tons, which is only 6 percent of the prewar annual average. Recent trends in the imports of rice into the various deficit countries of Europe are presented in table 8.

Prospects for marketing any large quantity of United States rice in Europe in the next few years do not appear to be encouraging. In the prewar period, the trend in Europe was toward purchasing a larger share of the total rice needs from nearby surplus areas in Italy and Egypt and from Asia. For the 1926-30 prewar period, United States rice exports to

Europe averaged 60,000 short tons annually, while exports to Europe in the 1936-40 period were less than one-half this amount. This downward trend is likely to continue as expanded supplies from Egypt and Italy will probably compete more strongly than they did before the war. In addition, most of the European countries are seriously short of dollar exchange and will likely spend all available dollar credits for more "essential" items.

If the United States rice industry makes a serious attempt to develop and expand rice markets in Europe, the supplies shipped should be of the grain type preferred by European consumers, milled according to European trade preferences. For most of Europe, this means short- and medium-grain rice shipped to Europe as brown or hulled rice. Although there is a demand in most European countries for highly milled, long-grain rice with low broken-grain tolerances, this proportion of our total exports to the area is likely to continue to be small. For most of the consumers in Europe, the difference in price is not justified by the quality differences. This situation is due to the fact that much of the rice in Europe is consumed in porridges and puddings where a short-grain rice with a high broken-grain content is equally as good from their viewpoint as long-grain whole rice.

TABLE 8.- *Net imports of rice into important deficit countries in Europe, average 1936-40, annual, 1946 to 1947*

COUNTRY	AVERAGE 1936-40	1946	1947
	Short tons	*Short tons*	*Short tons*
Austria	31,180	-	562
Belgium	55,774	-	17,500
Czechoslovakia	42,448	-	2,000
Denmark	9,518	2	-
Ireland	3,954	-	-
Finland	15,862	4	-
France	604,220	5,236	12,321
Germany	222,639	-	-
Greece	31,860	254	11,794
Hungary	21,719	-	-
Netherlands	95,226	-	2,250
Norway	5,368	-	-
Poland	36,304	819	-
Portugal	8,228	3,450	5,278
Rumania	22,647	-	-
Spain	35,019	(1)	3,307
Sweden	16,632	26	6
Switzerland	29,290	88	10,471
United Kingdom	149,486	8,292	5,192
Others	27,794	1,390	5,252
Total	1,465,168	20,561	76,933

[1] Net exports of 7,109 tons.

Office of Foreign Agricultural Relations. Compiled from official and other sources.

The European countries are likely to continue to import rice from the countries that will ship them lower priced brown rice rather than milled rice, because most of the countries have rice-polishing mills and have preferential tariffs in favor of brown rice, so as to utilize these mills to capacity and to provide byproduct feeds.

At the present time, Switzerland, Belgium, Greece, and the section of Germany occupied by the Allied Forces appear to be the most promising European markets for United States rice. Switzerland has the dollar exchange to purchase the rice and has had prewar experience with United States quality rice. If prices for medium-grain rice from the United States to Switzerland are reasonably in line with prices from Italy and Egypt, an annual market of from 5,000 to 15,000 short tons appears possible. Belgium has less available dollar exchange but it has imposed less rigid import controls than most other countries of Western Europe and its consumers also prefer United States quality medium-grain rice to all other types. Greece and Allied Germany, due to their close financial ties with the United States, should provide steady markets for small quantities, so long as our military and economic assistance to these areas continues. France will continue to obtain its rice supplies principally from French Indochina; and England, from Burma. Due to financial difficulties, Holland is not likely to import significant quantities until available from the Netherlands Indies. The Scandinavian countries like rice as a novelty food, but they consider it a luxury that they can do without until their dollar credit position is rebuilt.

The European rice-supply situation in the summer of 1948 indicated an effective evasion of the prevailing systems of rice controls and allocations. Although practically no rice was officially allocated to Europe in 1947 and the first half of 1948, except for such special purposes as hospitals and infant feeding, rice could be obtained, for a price, in practically every country studied.

Switzerland

The prewar consumption of rice in Switzerland averaged about 30,000 short tons of milled rice annually. About 30 percent of this rice was imported as white milled rice and 70 percent as brown rice. This brown rice was milled in 6 rice-polishing mills, which are located in the southern Italian-speaking part of Switzerland. Most of the prewar imports came from Italy, although small amounts were obtained from Siam, Burma, Brazil, Egypt, and the United States.

The southern part of Switzerland is the most important rice-consuming area in the country. In this section, per-capita consumption rates vary from 20 to 40 pounds annually when rice supplies are available. In addition, the mountain livestock herders use relatively large quantities of rice, when available, for summer food when they move their livestock up to the mountain pastures. These people report that rice is a good concentrated food, easy to carry long distances; thus, it is in demand for summer use by dairy farmers.

According to estimates by the trade and by Government officials, Switzerland would consume a minimum of about 22,500 short tons of milled

rice at the present time if it were available. The Swiss IEFC allotment for 1948 was 11,600 short tons - or about half the demand - which came from Egypt, Siam, Brazil, and Ecuador.

In 1948, Egyptian rice purchased as brown rice was reported to cost about $10.85 per hundred pounds, delivered at the Swiss border. Assuming an 80-percent normal yield of milled rice from brown rice, this means that the equivalent cost of white milled rice from Egypt was about $13.50 per hundred pounds. Milled white rice from Brazil was reported to cost $12.50 per hundred pounds delivered at the border. The import duties charged by the Swiss Government on rice amount to about 7 cents per hundred pounds on brown rice and 51 cents per hundred pounds for white milled rice. This difference in import duties stimulates the importation of brown rather than milled rice.

Consumer preference for rice in Switzerland is for a well-milled, clean, white rice with little or no broken grains. The people do not like rice with a high percentage of brokens. Before the war, the "Blue-Rose" quality from the United States (a medium-grain type) was reported to be the preferred rice, and the short-grain "Vialone" rice from Italy was also in demand. The Swiss report that long-grain rices usually contain a large percentage of broken grains and they cook unevenly under the customary methods of cooking rice.

At the end of the war, the United States Army turned over to the Swiss Government a large volume of surplus parboiled rice. This rice, reported to be yellowish in color and with an unusual odor, was included in the rationed allotments, but the consumers refused to purchase it, and it finally had to be used for livestock feed. Based on this one experience, parboiled rice is not at all popular with the rice trade or the consumers in Switzerland.

After their experience with wartime food controls, the tendency in Switzerland has been to turn food imports back to private business and to eliminate rationing and ceilings as rapidly as possible. Rice rationing was eliminated in June 1948, when rice importing was removed from Government control and prewar importers were permitted to resume operations. The policy of the Swiss Government was to issue import permits to private importers up to the full amounts of rice allocated by the IEFC. After that point had been reached, no additional official import permits were issued, but the indications were that additional rice did move in from unofficial channels. According to the Swiss officials in charge of food imports, the shift from Government to private business caused much difficulty in obtaining rice. The exporting countries in Asia, as well as Egypt and Italy, operated on a government-to-government basis. No private dealers were permitted to handle rice in the export trade, and the governments preferred to deal with other governments rather than with private dealers.

In regard to the prospects of selling United States rice in Switzerland, the attitude of the Swiss appears to be "wait and see." They state that they would like to have United States high-quality rice; are not particular that it be long, medium, or short grain; but do want it to be all whole rice, and not mixed whole rice and broken grains. They state that they have the dollars with which to pay for United States rice

and will buy it if prices are in line with prices in other countries, quality considered, and if exports from the United States to Switzerland are permitted.

Belgium

Prewar imports of rice into Belgium varied from 70,000 to 90,000 short tons annually, including all types of rice and rice products. In 1938, for instance, total imports were 87,000 short tons, of which 47,800 tons came from Siam, 15,800 tons from French Indochina, 6,600 tons from Egypt, 4,700 tons from the United States, 3,500 short tons from Burma, and the remainder in smaller quantities from several other countries. According to estimates of the trade, about half of the annual import of milled rice was brown rice, one-fourth was broken rice, and one-fourth was milled, whole rice. In addition, about 2,200 short tons of rough rice were imported annually, mostly from French Indochina.

Belgium did not consume all of this rice. Prewar exports of rice and rice products from Belgium varied from 11,000 to 27,500 short tons annually. In 1938, for instance, Belgium exported 12,000 short tons of rice and rice products to the United States, 1,700 tons to Germany, 1,000 tons to Holland, and 100 tons to Switzerland. Exports totaled 18,000 short tons. The exports of rice and rice products to the United States - which were more than double the imports of rice from the United States - were mostly in the form of rice starch.

Only a small part of the prewar volume of rice had been available for consumption in recent years, and the ration of 100 grams per person per month was not sufficient to meet the demand. The country now has a population of about 8 million. Belgians consume rice mostly as a supplement to chicken, in soups, and in baking, as well as in the manufacture of semolina. Broken rice and bran is also used for feed and for industrial purposes. Of the total consumption of rice in prewar Belgium, about 27,500 short tons was consumed as milled rice and about 44,000 short tons was used as broken rice in feeds and for industrial uses, annually.

There are no import duties at present on rice imported into Belgium. Duties existed before the war but were suspended. There is, however, a 9-percent consumption tax on rice, which is added to the retail price.

For direct consumption purposes, the type of rice preferred by Belgians is the long-grain or medium-grain type from the United States. According to the rice millers and dealers in Antwerp, "Every housewife in Belgium knows United States quality rice and wants it." They report, however, that in the past United States long-grain and medium-grain rice was usually too high in price as compared with the price of rice obtained from the Asiatic countries; thus, Belgium purchased most of its supplies elsewhere. The millers prefer that the rice be imported as brown, or cargo, rice. There are two large rice-polishing mills in Antwerp and several smaller ones with a combined annual milling capacity in excess of 132,000 short tons annually.

The millers, dealers, and Government officials reported that, at the retail price of about 13 cents per pound, the Belgian population

would easily consume 27,500 tons yearly of good, white, milled rice. They stated that additional amounts would be used for industrial purposes, if it were available, assuming it to be of the lower qualities and at a relatively low price. They reported that, although the dollar shortage in Belgium was serious, they earned some dollar credits and might use some of these funds for buying United States rice if, and when, the supply situation improved and allocations were made from the United States to Belgium and *if* the price were right. They considered the "right" price under current conditions to be not more than $10.00 per hundred pounds for milled rice.

France

Prewar imports of rice into France varied from 550,000 to 880,000 short tons annually. About 95 percent of these imports were from French Indochina. Of these imports, most of the rice was brought in as brown or broken rice. In 1938, for instance, imports of brown rice amounted to 353,000 short tons; broken rice, 114,000 tons; rice flour, 52,000 tons; rough rice, 33,000 tons; and milled rice, 42,000 short tons.

Only about 15 percent of these total imports were utilized as milled rice for direct consumption uses, 15 percent was used for industrial purposes in breweries and starch plants, and 70 percent went into livestock feed. France has 30 rice mills located in southern ports, which were not used to capacity even in prewar days and are now mostly idle. They report that these mills were not damaged during the war and that present milling capacity is at least equal to prewar.

According to official reports, France imported only 12,400 short tons of rice in 1947, or only about 2 percent as much as normal prewar imports. About 60 percent of these total imports was in the form of brown or unpolished rice, 20 percent was broken rice, and the remainder was rough rice and rice flour. No milled or polished rice imports were reported in 1947. Of these imports, about 80 percent came from French Indochina and smaller amounts from Iran, Italy, and other sources. In addition to these official imports, the indications are that some milled rice has moved into France from unofficial sources.

The loss of normal prewar imports has stimulated interest in the domestic production of rice in France. Thus, rice production in the country increased from 39,000 bushels of rough rice produced on 1,500 acres in 1943 to about 245,000 bushels produced on 5,930 acres in 1947. Farmers received a fixed price amounting to about $4.85 per bushel, or $15.00 per barrel, for this production. As in Italy, fixed prices were established by the Government at all levels. According to some specialists in France, the country has a potential production capacity of about 22,000 short tons of milled rice annually if all land suitable for rice were so used. The present production is of the short-grain, Italian-type rice produced under conditions similar to those in Italy.

There are about 30 rice mills in southern France, mostly near the ports of Marseille and Le Havre. The common prewar practice was to import brown rice for milling, utilize the byproducts for industrial

uses and feed, and market the finished product as milled rice. The millers prefer the short- and medium-grain rough rice because of lower breakage in milling. The mills were not damaged during the war and are reported to have a milling capacity equal to prewar days, but they are now being operated only at a small fraction of full capacity. Because of this idle milling capacity, rice imports into France in the immediate postwar years can be expected to be mostly in the form of brown rice.

French rice consumers prefer the long-grain, hard-rice types for direct consumption uses. In prewar days, long- and medium-grain rice from the United States and the "big-grain Madagascar rice" were the types in greatest demand, but only small quantities of United States rice were purchased because of the relatively high prices. There are no import duties on rice in France at the present time. In prewar days, import duties were imposed when a wheat surplus occurred in the country, in order to protect domestic wheat producers from cheap feeds made from rice and rice products. If a similar situation develops, these import restrictions can be expected to be reestablished.

Assuming rice prices at competitive levels with other foods, the long-time, postwar consumption of edible rice in France is expected to be about the same as in the prewar period, or about 110,000 short tons annually. France now has a population of 41 million people, about the same as prewar, and the direct consumption of rice averaged about 3 pounds per person per year in the period before the war. The prewar use of from 550,000 to 660,000 short tons of rice and rice products for feed and industrial uses will be reestablished only if rice becomes relatively cheap, as it was before the war, and if special concessions are to be made to French Indochina in order to maintain trade relationships.

As in other European countries, the largest stumbling blocks to sales of United States rice in France in the future appears to be the shortage of dollar credits and the relatively high prices that the trade in France expects will be asked for United States rice. In view of the uncertainty of the situation in French Indochina (where practically all of the prewar supplies were obtained) and the pent-up demand that exists for rice in France at the present time, however, France does appear to offer some possibilities as a postwar market for United States rice. This market should be fully explored as soon as allocations become available.

The Netherlands

In the prewar period, 1936-40, the Netherlands carried on a large import and export trade in rice and rice products. Imports of all types of rice amounted to about 229,000 short tons annually during this period, and most of these imports came in as brown, or cargo, rice and were milled in Holland. There are 20 fairly large rice mills in Holland, which operated almost to full capacity in prewar days. At the present time, however, only 6 of these mills are operating on a part-time basis, while the others are idle, due to the shortage of rice. None of these mills was damaged to any great extent during the war, and the present milling capacity is reported to be at least as great as in prewar days.

The general pattern of the prewar rice trade was to reexport, after milling, about half of the total volume imported. The average annual exports of rice in the 1936-40 period were in excess of 110,000 short tons annually. The general practice was to import brown rice, mill it in Holland, and export milled rice, retaining the byproducts for use in the country. The imports of brown rice came mostly from Burma, the Netherlands Indies, Egypt, and Siam. The exports of milled rice went to 50 different countries scattered throughout Europe, Africa, and Latin America.

Since the end of the war, very little rice has been imported into the Netherlands. Total imports in 1947 amounted to only 2,200 short tons, and total IEFC allocations for 1948 amounted to 13,800 short tons. The supplies available were used for infant feeding, and no general ration to the people was issued. With the increased supplies expected after midyear the Government planned to start its first general rice-ration issue in September 1948. The planned ration was to be about 6 ounces per person per month and was to retail at about 19 cents per pound.

For direct consumption uses, the Dutch people prefer long- and medium-grain rice when they can afford it. In prewar days, the trade reports that United States rice of the medium- and long-grain types was liked best of all, but the price, much of the time, was so high in relation to other sources of supply that only small quantities were imported.

Assuming that rice supplies become more adequate and allocations of rice from the United States to the Netherlands are made at some future date, the general opinion of the Dutch rice trade and the Dutch Government officials contacted is that Holland is still not likely to buy much rice from the United States. They stated that the serious dollar shortage in Holland would prevent their buying United States rice, even though they like it best and even if the price were competitive.

There are no import taxes on rice in Holland at the present time. The prewar duty on milled rice was about 2 cents per pound. For brown or cargo rice, however, special concession were made, which reduced the average duty for this type of rice to about one-fourth of the duty on milled rice. The opinion of the trade is that, when rice supplies become more abundant, somewhat similar import regulations will be imposed.

The import-duty regulations in prewar days encouraged the importation of brown rather than milled rice. This was done so as to stimulate the milling industry within Holland and to provide byproducts for livestock feeding. The Netherlands rice trade reports that its members would much prefer to buy brown rather than milled rice and are likely to buy most of their rice in the future, as they have in the past, from the countries that will sell them brown rice at relatively low prices. They state that, at the present world prices for rice, the Dutch Government is not likely to permit much more rice to come in than the current IEFC allocation. If rice prices declined about 20 percent, however, they feel that Government restrictions on rice imports would be modified.

Denmark

Prewar imports of rice and rice products into Denmark averaged about 10,000 short tons annually, although there was much variation from

year to year, depending on changes in rice prices. The source of these imports also varied from year to year. In 1936, about half of the total imports came from Spain, and the remainder from India and Siam. In 1937, two-thirds of all imports came from Italy, and the remainder from Siam. In 1938, 40 percent of all imports came from Italy, 35 percent from Siam, 20 percent from the United States, and 5 percent from other sources. According to the trade, the usual practice was to purchase rice where the price was most reasonable.

Most of the rice imported into Denmark was brought in as milled polished rice. There is one small polishing mill in Denmark and several oat mills that have been used to polish rice on occasion, but the amount of rough or brown rice brought into Denmark has always been small and is not likely to increase in the near future. Prewar imports averaged about 50 percent whole head rice, completely milled; 40 percent broken rice; and 10 percent rice flour and rice starch. Because of the method of consuming rice in Denmark and the importance of relatively low prices, the proportion of broken rice to head rice and the percentage of broken grains in the imported milled rice have always been relatively high and are likely to continue on this basis.

There have been no official imports of rice into Denmark since 1940, and practically no rice has been available to most consumers during the past 8 years. The Economic Cooperation Administration's plans for the 1948-49 fiscal year included 1,100 short tons of rice to be shipped from the United States to Denmark. The preliminary plans of the Danish Government, as developed for the ECA program, indicated that, if dollars were available to purchase it, they would like and would consume 16,500 short tons in 1948-49, including 8,800 tons from the United States and 7,700 tons from other sources. Because of the shortage of dollar credits and the expected high price of United States rice (estimated at $10.43 per hundred pounds), the final plan included only 1,100 short tons of rice.

Rice, in Denmark, is consumed mostly as a special holiday dish, which is a traditional part of dinner on Christmas Eve and on other festive occasions. It is cooked as a thickened, sweet porridge, in milk, with fruits added on some occasions, and is served as the first and most important course of this meal. The traditional custom is to put one almond in the big bowl of rice porridge, and the legend is that the individual who gets the almond will have a lifetime of good luck, provided that he does not report the fact until all the rice is eaten. The result is that the supply is always eaten down to the last grain. Thus, rice in Denmark is as important to the Christmas Holidays as turkey in the United States or meat pie in England.

The method of cooking - which results in a thickened, sweetened, souplike dish - indicates why large quantities of broken rice are consumed and there is little preference for high-quality, long-grain rice. The trade estimates that about half of the total normal rice supply is consumed in this one meal; another one-fourth as a similar dish on other festive occasions; and the remaining 25 percent is consumed as a side-dish with chicken or meats. From reports obtained in Sweden and discussions with individuals familiar with rice-consumption

habits in Norway, it is assumed that all of the Scandinavian countries have this same consumption habit in regard to rice.

This method of consumption points up several important factors relative to the marketing of rice in Denmark as well as in Sweden and Norway. Because of this method of use, there is no large-scale demand for long-grain rice or for high-quality rice with a low percentage of broken grains. Thus, the demand in these countries in the past has been for a white well-milled rice that could be obtained at the lowest price, regardless of the grain type or the percentage of broken grains. This type of demand is likely to continue to predominate in these countries in the future. This does not mean that there is no market for long-grain rice in the Scandinavian countries. In the past they have purchased, and paid premium prices for, long-grain rice in small quantities. It does mean, however, that any plans for the development of volume markets for rice in these countries should be based on supplying them with short-grain and broken rices at relatively low prices.

There is an import duty of 2 Danish ore per kilo on all rice and rice products imported into Denmark. This duty - the same for brown, broken, or milled, whole rice - amounts to about 2.5 cents per pound.

Sweden

Prewar imports of rice into Sweden averaged about 16,500 short tons annually, including about two-thirds as white milled and broken rice and one-third as brown, or cargo, rice. Most of these imports came from the Netherlands, Egypt, the United States, Brazil, Burma, the Netherlands Indies, and Siam.

Sweden has an import duty of 2 Swedish kroners per 100 kilos of white, or milled, rice but has no import duty on brown, or cargo, rice. This amounts to about 2.5 cents per pound for milled rice, with no import duty on brown rice. The same import duty existed before the war and has been maintained to encourage the importation of brown rice, so as to utilize the available milling capacity and provide rice byproducts for feed and industrial use. Sweden has two large rice-polishing mills with a reported annual capacity of 22,000 short tons of brown rice.

After 1940, Sweden found it impossible to import brown rice, and all imports from 1941 to date have been of white milled rice. These imports varied from a high point of 16,400 short tons in 1943, mostly from Brazil, to only 5 tons in 1947. For 1948, 2,750 short tons were allocated to Sweden from Siam, to be paid for in sterling.

The prewar imports of rice into Sweden were made up of about 70 percent short-grain rice and 30 percent medium- and long-grain types The trade reports that the price factor is the most important item determining the choice of short-, medium-, or long-grain rice and that, in the future, short-grain brown rice will be purchased in preference to long- or medium-grain milled rice and that the country or countries that will supply them with this type of rice will get the business. It also stated that there is some demand in Sweden for high-quality, medium- and long-grain milled rice, in small quantities, but that most of the demand will continue to be for the lower-quality broken and for brown rice.

The reason for this general lack of preference for long-grain rice is the same as in Denmark and Norway - the method of cooking rice and the importance of obtaining relatively cheap rice. The prewar imports of rice into Sweden from the United States, which averaged about 2,200 short tons a year before the war, increased to about 5,200 tons in 1941 and 7,400 short tons in 1942. The trade reported that most of this rice was of the "Pearl" type, which is short-grain rice. They also reported the importation of some of the "Edith" and "Blue-Rose" types and stated that premium prices were obtained for small quantities of this rice. They concluded that there will continue to be a market in Sweden for some high-quality rice but that only small quantities can be expected to be absorbed by the consumers.